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HISTORY OF CANADIAN SURGERY

THOMAS GEORGE RODDICK

1846-1923

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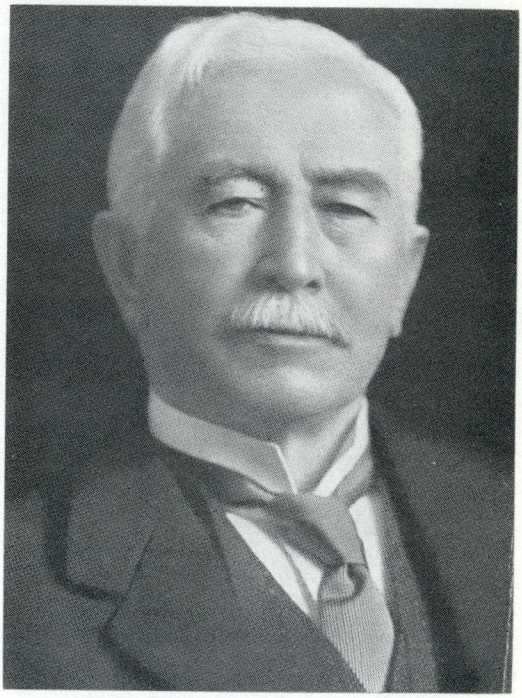
THE NAME of Thomas Roddick is linked with the early use in Canada of Lister's antiseptic method more definitely than is the case with any of his contemporaries; there is no doubt that he hastened the acceptance of its principle. By his personality and character he also exercised a wide influence in his time, professionally, socially, and politically.

Born in Newfoundland in 1846, Thomas George Roddick began life with all the advantages of a good education. Like many of his contemporaries he intended to take his medical training in Edinburgh, but was persuaded to enrol at McGill University, where he graduated in 1868 with high honours. His energy and unquestioned ability made him a natural leader, and he rose to high teaching and administrative responsibilities as Professor of Surgery and later Dean of the Faculty of Medicine at McGill. He was one of the group in Montreal which included such men as Osler, Shepherd, Blackader, Buller and James Ross, who met frequently to dine as a club, and incidentally to develop the activity which is so well reflected in the medical journalism of the day. He soon began to contribute to the *Canadian Medical & Surgical Journal*, under the influence of its editor George Fenwick, who had been mainly instrumental in having him train at McGill.

Roddick graduated about three years after Lister had begun his work on antisepsis. It would be interesting to know what reference to Lister's work had been made in the surgery lectures at McGill at the time that prompted the question on Roddick's final surgical paper, "What is meant by the antiseptic treatment in surgery? In what cases is the use of carbolic acid especially indicated?" Certainly no one in Canada seems then to have grasped Lister's idea, although A. E. Malloch of Hamilton, Ontario, one of Lister's house surgeons in 1868, had begun using Lister's method in 1869.



Dr. Thomas George Roddick

In 1872 Roddick visited Edinburgh and saw Lister at work, but not until after a second visit in 1877 did he bring back Lister's carbolic spray and begin using it in his hospital work. Within twelve months he read a paper at the annual meeting of the Canadian Medical Association, describing his experience with antisepsis, and one year later he published the first comprehensive Canadian report on a series of cases thus treated.* These were from the wards of the Montreal General Hospital. He said that he had no "accurate comparative statement of the surgical results of the Hospital before and after the introduction of Lister's method", but his mortality rate was so strikingly low that his report carried immediate though perhaps not universal conviction. His comment was:

"We have then a record of 64 major operations with two deaths, being a mortality of

Montreal General Hospital Reports, Vol. 1, 1880.

3.12 per cent. There are few British hospitals whose statistics can compare favourably with these. The late lamented Callender of St. Bartholomew's boasted of a mortality of barely 3.4 per cent, his operations being performed by a modified antiseptic method.

"To give some further idea of the great change wrought by 'Listerism' in our own hospital, I would quote the results of the amputations of the lower extremity during the last two years of the old system. Of four amputations of the thigh recorded, *all were fatal.* Of six amputations of the leg, *four* were fatal."

It should be added that others in Canada, notably F. J. Shepherd, had shown an equally keen perception of the principles of Lister's work. Indeed, Roddick had been apt to cling too closely to the soon outmoded carbolic spray. But to him must be given the credit for an impetus in the adoption of antisepsis in surgery which no other surgeon in Canada could claim.

In 1885 there was a brief but extremely active interlude in Roddick's practice. The Riel Rebellion broke out in Saskatchewan in that year, and a force of about 5000 men was assembled to deal with it. Roddick was chosen as chief of the medical staff in the field, on the grounds that he was "one of the most distinguished Canadian surgeons, young, full of vigour, of powerful physique, knowing no fatigue, and a first class horseman." Of even more importance was his shrewd commonsense and natural administrative powers. All these qualities were now to be fully tested.

The campaign was short – March to August – but it presented peculiar difficulties in organization and transport, to say nothing of unusually harsh winter conditions at first. Roddick met all these with vigour and good judgment, and reports on the medical aspects of the campaign have nothing but praise for his work. It was the occasion for use of what was probably the first hospital ship in Canadian military operations. This was a special barge put into service by Roddick to transport the wounded from the field hospital at Saskatoon down the Saskatchewan River and Lake Winnipeg, to Winnipeg, a distance of 1100 miles, the trip taking 11 days.

There was remarkable freedom from sickness amongst the troops. This was ascribed vaguely to "the tonic and strengthening properties of the northwest country", though these were of a somewhat heroic quality in view of the bitter weather which the men, most of them raw recruits, had to face without adequate protection during the first few weeks. It was fortunate that by the time warm weather arrived, with the attendant possibility of typhoid fever, most of the fighting was over. Roddick later spoke of the extraordinary freedom from infection amongst the operative cases, not with any special reference to antisepsis, for he had little chance of operating himself, but realizing that the tent hospitals had not the background of old septic conditions.

For about the next ten years Roddick was fully absorbed with his teaching and professional work, as well as general medical affairs. In 1897 he was chosen president of the British Medical Association on the occasion of its first visit to Canada, in conjunction with the Canadian Medical Association – the first Canadian to be chosen for this position. Lord Lister was his guest on his visit to Montreal at that time.

The Canadian Medical Association has received from Dr. T. C. Routley an interesting historical link in the shape of the badge which was worn by Lord Lister at this combined meeting; it was pinned on to his lapel by Roddick. A friend of the Lister family gave it to Dr. Routley in England, when he was completing the same duties as President of the British Medical Association which Roddick had carried out 59 years before in Montreal. It was thought appropriate by the donor that the badge should come back to Canada through the medium of one who had himself occupied this combined office.

In 1894 Roddick began active work on what was to be his most notable achievement, that of establishing uniformity of medical registration throughout Canada. Ever since its formation in 1867 the C.M.A. had given close and constant attention to this subject. In spite of most devoted labours it was eventually admitted that the matter presented apparently insuperable

difficulties. At the root of these lay the fact of Provincial autonomy in matters of education – *all* education. Registration of doctors involved their education, and so far it had never been possible to persuade all nine sternly independent (and not over-enthusiastic) Provinces to accept one uniform method.

Roddick was given the task of chairmanship of a C.M.A. committee on registration, and he began then his long uphill task of coordinating the views of the profession and soothing the sensibilities of nine Provincial licensing bodies. He actually managed to obtain most encouraging support from the profession on a report suggesting a form of Federal legislation. But as Parliament could not infringe on Provincial rights, and the Provincial legislatures would not unite to recognize a central board, an impasse developed.

Roddick was elected to Parliament in 1896, but as his party (Conservative) was then in opposition he could do little in the House and spent the next five years in influencing medical opinion throughout the country.

At last in 1901 he was able to bring in his Dominion Medical Bill. The essential feature of this was the formation of a Dominion Medical Council, whose diploma gave the right to practise throughout the Dominion. In 1902 he managed to get the Bill accepted in the House, and then came nine years of incessant labour to gain consent from each province separately, which had been conditional in acceptance of the Bill.

In 1911 his magnificent patience was rewarded by the passage of the Bill creating a Dominion Medical Council. Even Sir Charles Tupper, a master politician, had thought it was a hopeless venture and told Roddick that he would never be able to carry it through. Roddick was not essentially a politician. This particular achievement demanded qualities of tenacity, patience, good nature, and a knowledge of men, all of which may be found in a politician, it is true, but not necessarily with a personality such as his. His work was recognized by a knighthood in 1914.

Roddick is deservedly looked up to as a leading figure in Canadian medicine. He died in 1923, of a form of pernicious anæmia, with subacute combined sclerosis.

WILLIAM HARVEY IN RETROSPECT*

"The theme of this address has been suggested by the successful operation in Auckland over the past 12 months of the heart-lung machine. Inevitably our minds have been drawn the more closely to that great man who started it all, William Harvey. How he would have rejoiced in this working exemplification of his *de Motu Cordis et Sanguinis*. We might easily suppose that he could have foreseen, and perhaps did foresee this modern construction, in which 'he being dead yet speaketh'. It seems appropriate that we should again turn our minds to Harvey and his work, to see in retrospect their place in medicine historically and philosophically. . . .

"We need not look on the history of medicine as something divided from us by a great gap. History is what has happened right up to this 'now' when time-past meets time-to-come. Our own teachers in the faith are as significant as those whose names we remember only because they are attached to a structure, a symptom, or a disease complex. Today in the face of so great an accumulation of detail in physiology, pathology and therapeutics, the past seems to have been blotted out by the overwhelming present. . . .

"We can better estimate the greatness of Harvey when we remember that he worked and wrote without advantage of any magnification other than that of a hand lens and without knowledge of oxygen and oxygenation. His lecture notes show that as Lumleian Lecturer on Anatomy to the Royal College of Physicians he had been teaching the circulation of the blood for at least 12 years before he ventured into print. He was not himself unaware of the importance of his work . . ."

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*Robertson, H. G.: *New Zealand M. J.*, 59: 28, 1960.

ORIGINAL ARTICLES

SPONTANEOUS INTRACRANIAL HÆMORRHAGE: "SUBARACHNOID HÆMORRHAGE": A REVIEW OF INVESTIGATION AND TREATMENT IN 189 CASES*

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AN UNKIND FATE has so governed the chances of survival following spontaneous intracranial bleeding ("subarachnoid hæmorrhage"), that surgical intervention has become an urgent consideration in a large proportion of these cases. Unforgettable are those patients who recover from an initial hæmorrhage, only to succumb suddenly to unexpected recurrent bleeding a few days or weeks later. Furthermore, an operation becomes mandatory to preserve life and cerebral function in the large number of cases harbouring a discrete intracerebral clot (26% in this series).

The prevention of recurrent bleeding has become a problem of major surgical importance. This is particularly true of ruptured intracranial aneurysm, the chief offender, which has also proved the most difficult to eradicate safely. Although obliteration of the aneurysm is usually possible, the exposure with deep retraction and concomitant arterial spasm may precipitate a disastrous train of events leading to massive cerebral softening and swelling, with profound alteration of cerebral function or death. Surgeons have accepted the burden of proof that surgical treatment leads to a lower mortality rate than the 50% widely accepted under conservative regimes. With the knowledge that most aneurysms are small and accessible the pursuit of safer surgical methods will continue so that it may become possible to eliminate routinely the dread of recurrent bleeding.

Careful scrutiny of individual series of cases will serve to increase our knowledge of this catastrophe and further the development of effective treatment. This report is based on 189 patients who, before angiography, were considered to have bled from an intracranial arterial aneurysm or angioma. Patients with hypertensive cerebrovascular disease and those not having angiography have been excluded. Sixteen angiomas and 68 aneurysms were treated by direct surgical management. Seventy percent of the aneurysms were operated upon within one week of the last hæmorrhage and 50% were treated within 48 hours.

RESULTS OF INVESTIGATION

The presence of intracranial bleeding was verified in each case by lumbar puncture. Visualization of the cerebral arterial tree by the minimum of bilateral carotid angiography demonstrated in the majority of instances the nature and site of the offending lesion and the dynamics of the local and collateral circulation; without this information no rational plan of management or estimate of the prognosis can be made. Because of the danger of early recurrent bleeding, the general policy has been to perform bilateral carotid angiography shortly after admission, using appropriate compression to demonstrate the cross circulation. Although cerebral angiography is said to be not without risk at this stage, only one patient (who was seriously ill) suffered a fatal recurrence during the procedure and there were no other serious sequelae. The majority received premedication with papavarine and local anæsthesia.

Carotid angiography in 189 patients revealed the source of bleeding in 127 (Table I).

Vertebral angiography in 30 patients with negative carotid angiography demonstrated a lesion in a further eight cases. Thus angiography revealed the nature and site of the hæmorrhage in 135 of 189 cases or 71% (Table II).

PATIENTS WITH NEGATIVE ANGIOGRAPHY

Fifty-five patients, of whom 22 had vertebral angiography, appeared to have no

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*Presented at the Annual Meeting of the Royal College of Physicians and Surgeons of Canada, Montreal, January 1960.

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TABLE I.—Angiography in 189 Patients

Carotid positive	127
Vertebral positive	8 of 30
Total	135 or 71%

abnormality of the cerebral vascular system. Twelve have died of recurrent bleeding (Table III). This mortality of 22% was much higher than the 5% to 10% mortality generally ascribed to this group. Of the five autopsies performed, an aneurysm was found in four: carotid-posterior communicating, carotid bifurcation, middle cerebral trifurcation, and one on the right vertebral artery which ruptured and killed the patient on the morning of the proposed vertebral angiography. The survivors have been followed-up for periods varying from nine months to seven years, the average being 3.4 years.

A review of the arteriograms performed on the four patients who died from aneurysmal rupture did not disclose the lesion, but local spasm of the carotid artery was seen adjacent to the carotid aneurysm at the posterior communicating artery. On two occasions an aneurysm was demonstrated by repeat angiography. One was seen at the carotid-posterior communicating junction three weeks after the initial arteriogram which showed only intense local spasm. The second was at the basilar termination, 10 weeks and two hæmorrhages after initial filling of vessels of normal calibre. It is therefore important that, following initial negative angiography, the studies be repeated in two or three weeks or at least before discharge. Four patients had an exploratory craniotomy because the angiograms showed local arterial spasm or the questionable filling of a stump but in no instance was the source of bleeding discovered.

Patients With Tumours

Three patients bled from a tumour,

TABLE II.—Angiography in 189 Patients

	Cases	*Percentage*
Aneurysm	110	59
Angioma	21	11
Tumours	3	1
Negative	55	29
Total	189	

TABLE III.—Negative Angiography

Patients	*Alive*	*Dead*
55 (22 had vertebral angiography)	43 (78%)	12 (22%) (4 aneurysms found at post-mortem)

previously unsuspected: one with a middle sphenoid ridge meningioma, one a metastatic melanoma and one a metastatic carcinoma from the prostate.

Conservative Treatment of Patients With Verified Aneurysms

Forty patients, known to have bled from an aneurysm were not operated upon for a variety of reasons including age, associated disease, critical condition, technical difficulty or inoperability, or unwillingness on the part of the patient, attending physician or the family to accept the risk of operation. Three patients died with recurrent bleeding before a planned operation could be carried out. Spontaneous thrombosis apparently occurred in two aneurysms as shown by serial angiography. Because of this selection the group cannot be used for comparison with surgically treated cases (Table IV).

Arteriovenous Malformations

Twenty-one, or 11% of the patients proved to be bleeding from an arteriovenous malformation. In 19 the malformation filled through the carotid circulation but one pontine and one occipital angioma were visualized only by vertebral angiography. Intracerebral clots were found in 11 cases, principally with the smaller, more deeply seated malformations (Table V). Three angiomas were situated deeply within the hemisphere or in the midline and were considered inoperable and these

TABLE IV.—Verified Aneurysms—Conservative Management

A selected group—cannot be used for comparison

Grade	*No.*	*Alive*	*Dead*	*Disabled*
1	18	13	5	3
2	2	1	1	
3	5	4	1	2
4	2	1	1	1
5	13		13	
40 patients		19 alive (6 disabled)		
		21 dead (52.5% mortality)		

TABLE V.—Angiomas—21 Patients

2	Moribund (clots)—died
3	Central (no operation)—alive
16	(9 with clots)—intracranial operation —No operative mortality
	13—total removal
	2—major feeder clipped (2 late deaths—4 and 5 years)
	1—muscle pack

patients have remained well for two, three and five years respectively. Two patients with intracerebral bleeding were moribund with fixed pupils and died shortly after admission.

Sixteen patients, nine of whom were stuporous and hemiparetic with intracerebral clot, were operated upon with no mortality or serious morbidity. Artificial hypothermia has not been used in these cases. Total removal of the malformation and associated clot, if present, was accomplished in 13 cases. One small deep temporal angioma invading the side of the midbrain was superficially packed with hammered muscle and there has been no recurrent bleeding in the year elapsed. In follow-up, the results in all but one case with a preoperative hemiplegia were classed as "excellent" or "good". In two deeply seated midline lesions the hypertrophied major feeding arterial channel was clipped without incident and the postoperative angiograms showed absence of filling in one and greatly reduced circulation through the other. However, both these patients suffered massive recurrent bleeding five and four years later. The first died in a few hours as the result of the hæmorrhage and the second died following a craniotomy in another centre. Although there was no alternative in these cases, the occurrence of delayed bleeding casts doubt on the efficacy of ligature of feeder vessels in circumstances where the malformation can be excised.

TABLE VI.—Distribution of 110 Bleeding Aneurysms (Angiography)

Anterior cerebral artery:		
(a) first part	1	
(b) at anterior communicating	33	
(c) distal part	1	
Carotid artery:		
(a) at posterior communicating	49	
(b) bifurcation	2	
Middle cerebral artery	18	
Basilar	5	(2 fusiform)
Posterior cerebral	1	
Patients with multiple aneurysms	10	

TABLE VII.—Grading of Cases—(Botterell)[1]

1. Conscious.
2. Drowsy without significant neurological deficit.
3. Drowsy with significant neurological deficit and possibly with clot.
4. Major neurological deficit deteriorating with clot or old patients with less severe deficit but degenerative vascular disease.
5. Moribund or near moribund with failing vital centres and with extensor rigidity.

Ruptured Intracranial Aneurysm

The distribution of 110 bleeding aneurysms is summarized in Table VI.

The results of surgical treatment of ruptured aneurysms depend in large part on the site of the aneurysm, the clinical state of the patient and the interval between the hæmorrhage and operation. Thus local factors such as cerebral swelling with retraction for deep exposure and arterial spasm adjacent to a clip are more important in the relatively small vessels of the anterior communicating region than in carotid aneurysms. Another major factor bearing on the outcome is the preoperative state of the patient, in terms of level of consciousness, associated intracerebral clot or ischæmic softening, age, and the presence of degenerative cerebro-vascular disease. Botterell *et al.*[1] have summed up these variables as they bear on the individual patient by a system of grading (Table VII).

It is well known that the risks of an intracranial procedure are greatly lessened by an interval of two weeks or more from the time of the last hæmorrhage. Unfortunately, this interval covers the period marked by high incidence of recurrent bleeding and many patients would be lost or crippled while awaiting a safer time for operation.

In a study of the prognosis in subarachnoid hæmorrhage Höök[2] found mortality to be the highest on the first day after hæmorrhage and 33% of the patients died within two weeks. After two weeks the mortality decreased appreciably and

TABLE VIII.—Surgical Methods

Indirect (internal carotid ligation)		2
Direct—		
clip or ligature	60	
muscle pack	4	
gauze filigree	2	
proximal carotid clip	2	
	68	
Total		70

was 20% after eight weeks. In Walton's series,[3] 91% of the deaths resulting from the first hæmorrhage, and 61% of the deaths from recurrent bleeding occurred within two weeks of the initial hæmorrhage. The peak incidence of recurrent bleeding was in the second week. Because of this fact, it has been our policy to treat these cases as urgent problems with immediate angiography and early operation.

Seventy patients shown to have an aneurysm by angiography were subjected to an operative procedure. Forty-eight (70%) were operated upon within one week of the last hæmorrhage and 36 (51%) were explored within 48 hours.

In all but two instances a direct attack on the lesion was undertaken (Table VIII).

An effort was directed towards obliteration of the aneurysm by silver clip or by a ligature. The neck of the aneurysm was considered unsuitable for clipping in eight patients who are discussed under their respective categories. All but four of the surviving patients with a clip or ligature on the aneurysm were subjected to postoperative angiography. The aneurysm was shown to be obliterated except in two patients with middle cerebral artery aneurysms which produced fatal recurrent hæmorrhage in 10 days and 24 hours respectively. An Olivecrona clip slipped off the neck in the first case and two ligatures had rolled down the fundus of the aneurysm in the other.

In this regard it is important to place a clip fully across the neck or fundus of an aneurysm for, as has been seen in the operating room, those placed part way across have a tendency to slide off slowly with the pulsations of the proximal portion of the lesion. Great care must be taken when using a ligature on the neck of an aneurysm arising from a small parent vessel. Tightening the knot at the very base of the sac may produce a kink in the artery with resultant stenosis or even occlusion of this vessel. Three postoperative deaths in this series were a direct result of massive cerebral softening from kink-producing ligatures on the necks of large anterior communicating and middle cerebral aneurysms.

The surgical attack on aneurysms has been conducted under hypothermia since 1955. Of 24 patients operated upon without hypothermia, 12 died. This excessive mortality of 50% was largely the result of operations on sick patients with ruptured anterior communicating aneurysms. In contrast, 46 patients cooled to 27° to 30° C., were operated upon with 11 deaths, a 24% mortality (Table IX). This improvement resulted in large part from reduction of cerebral swelling and control of hæmorrhage from aneurysmal rupture at operation. In addition a major feature has been the routine use of brief periods of occlusion of the carotid and occasionally the vertebral arteries in the neck lasting four to eight minutes. This has allowed swift completion of the dissection of the slack aneurysmal sac and placement of a clip without the same danger of rupture with frantic attempts to control bleeding.

TABLE IX.—Artificial Hypothermia

	Patients	*Deaths*	*Percentage*
Not used	24	12	50
Used	46	11	24

Carotid Aneurysms

Two patients had ruptured carotid bifurcation aneurysms. One was clipped successfully—the other tore at its base when clipped and the bleeding was controlled finally by a clip on the carotid just below it. A permanent hemiplegia occurred on the second postoperative day.

Of 30 ruptured carotid-posterior communicating aneurysms, 23 were approached directly with eight deaths. Four deaths followed attempts to save three Grade 5 and one Grade 4 patients. Four Grade 3 patients died as a result of errors in judgment and technique. Two deaths occurred from recurrent bleeding as a result of slipping of narrow Olivecrona clips. In another patient, a second "security" clip nudged the first and tore the neck of the sac. The bleeding was controlled with muscle but fatal recurrent hæmorrhage occurred the following day. The fourth patient with two carotid aneurysms died suddenly a few hours after operation. The autopsy disclosed that a Mayfield clip had finally torn the base of the previously unruptured short sessile aneurysm which lay under the optic

TABLE X.—Carotid Aneurysms

Risk	0—48 hours		2—7 days		7—14 days		over 14 days	
	No. of patients	*No. of deaths*	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*
1.....	2	0	4	0	2	0 (1p)	6	0
2.....	1	0	1	0			1	0
3.....	7cc	3	1	0	2c	2	1	0
4.....	1c	1c			0	0		
5.....	3c	3c						
Totals.....	14	7	6	0	4	2	8	0

Legend: c—intracerebral clot in one case. Total of 32 patients: 9 deaths
p—poor result 1 poor result

nerve at the origin of the ophthalmic artery. Three aneurysms considered unsuitable for clipping were packed with hammered muscle. One Grade 5 patient died a few hours later. The other two have remained well for one and three years. In another case it was possible to insert a piece of muscle into the aneurysmal sac through a large rent in its neck caused by manipulation. Postoperative angiography failed to fill the aneurysm and the patient has remained well for five years.

The two carotid ligations were performed in this group. One 63 year old hypertensive woman with a non-protein nitrogen of 63 mg. % died from recurrent bleeding the day after a Selverstone clamp was completely closed. The aneurysm in the other patient was shown by angiography after internal carotid ligature in the neck, to be thrombosed.

As a group, carotid aneurysms are the most satisfactory to attack directly. Excellent exposure of the neck of the aneurysm is obtained by a subfrontal approach along the sphenoid ridge using a minimum of retraction. The ipsilateral common carotid artery may be compressed for brief periods by the anæsthetist under the drapes during the dissection of the neck of the aneurysm and the application of a clip. Unlike the anterior cerebral-anterior communicating region, parent arterial spasm did not prove to be the same postoperative hazard. It occurred in only one case on the fifth postoperative day with a sudden hemiplegia, proved by angiography to accompany massive spasm of the carotid siphon.

Anterior Cerebral—Anterior Communicating Aneurysms

Table XI summarizes the results of treatment in 24 cases.

All but two were found in the anterior communicating region. One large proximal anterior cerebral aneurysm was trapped between clips and one distal aneurysm was clipped after removal of an interhemispheral subdural clot, both without incident. Nineteen anterior communicating aneurysms were clipped at the neck with seven deaths. One short sessile aneurysm in a hypertensive patient was considered unsuitable for clipping and was packed with hammered muscle. Death followed recurrent hæmorrhage three weeks later. Two patients succumbed with massive bi-

TABLE XI.—Anterior Cerebral—Anterior Communicating Aneurysms

Preoperative risk	0—48 hours		2—7 days		7—14 days		over 14 days	
	No. of patients	*No. of deaths*	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*
1.....	1	0					4	1
2.....	3c	0	2	1 (1p)				
3.....	3	0 (3p)	1	1	1c	0	1	0 (1p)
4.....	3	2						
5.....	3cc	3	2	2				
Totals.....	13	5	5	4	1	0	5	1

Legend: c—intracerebral clot Total of 24 patients: 10 deaths
p—poor result 5 poor results

frontal softenings consequent to kink-producing ligatures on the necks of large anterior communicating aneurysms.

Early operation on Grades 4 and 5 patients was uniformly unsuccessful in preserving useful life and merely caused further damage to an already critically injured brain. The only survivor among eight cases was classified as "poor" because of continuing dementia. On the other hand, of ten early operations in the better risk groups, only two patients died but results in three Grade 3 patients were classified "poor". Both deaths were the result of delayed cerebral swelling (two and three days) which was not controlled by removal of the bone flap and subtemporal decompression. Urea was not in use at the time but it may well prevent or control this problem in many instances.

The anterior communicating region is the most difficult to expose in a satisfactory yet safe fashion. Firm, deep retraction and removal of the postero-medial corner of the orbital surface of the frontal lobe is often required. Adjacent are the depths of the frontal lobes and anterior hypothalamic region, irrigated by the central branches of the anterior cerebral arteries. Stretch on these tiny vessels and parent arterial spasm particularly during early operation on very sick patients, may result in bilateral frontal and deep cerebral softening and swelling which may be incompatible with life or render the patient stuporous or demented. To facilitate good exposure with gentle retraction, an effort must be made to obtain a slack brain through some combination of intravenous urea, hypothermia and lumbar or ventricular drainage of cerebrospinal fluid. The concomitant use of papaverine, procaine[4] and phentolamine[5] on the exposed vessels apparently minimizes arterial spasm.

Middle Cerebral Aneurysms

The results of treatment in 11 cases of ruptured middle cerebral aneurysms are indicated in Table XII. Of importance is the fact that nine of the 11 aneurysms had produced a significant intracerebral clot, temporal or temporo-parietal, with a deep frontal extension in one case. The presence of a clot can usually be forecast by the elevation of the middle cerebral leash of vessels. This should not be a deterrent to operation. Seven of nine patients with intracerebral bleeding survived and only one was considered a poor result from a pre-existing neurosis and intractable headache. The aneurysms arose at the trifurcation of the artery and lay on the insula in 10 cases. They were exposed by removal of the anterior portion of the temporal operculum. Evacuation of clot not only provided room but often left most of the dissection of the aneurysmal sac complete.

One patient, under treatment for subacute bacterial endocarditis, developed a massive temporo-parietal clot from a rupture in one of the deep ascending parietal branches. The bleeding artery was clipped but unfortunately the segment was not excised. It was presumed to be a ruptured mycotic aneurysm. Two patients with temporal clots had large aneurysms with broad necks involving the trifurcation. These were treated by wrapping the whole of the aneurysmal sac with surgical gauze, gathered and tied at the neck. There has been no recurrent bleeding from the reinforced sacs and the patients have remained well for five and eight years respectively.

TABLE XII.—Middle Cerebral Aneurysms

	0—48 hours		*2—7 days*		*7—14 days*		*over 14 days*	
Risk	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*
1							1	0
2	1	1					1c	0
3							2cc	1
4	4cccc	0p	1c	0				
5	1c	1						
Totals	6	2	1	0			4	1

Legend: c—intracerebral clot
p—poor result

Total of 11 patients: 3 deaths
1 poor result

TABLE XIII.—Basilar Aneurysms

Site	*Risk*	*Result*
At superior cerebellar artery	3	well
Bifurcation	3	R. field defect
Bifurcation	4	died

The remaining eight aneurysms were occluded by a long clip or ligature. There were three postoperative deaths, one of which was clearly avoidable. In this patient recurrent hæmorrhage occurred 24 hours after a large sac had been deliberately opened and then occluded by two silk ligatures at the base. Re-exploration revealed that the ligatures, still intact, had been rolled down the limp sac by the proximal pulsations to a point just beyond the original rent. The patient died seven days later from massive softening of the hemisphere and it was discovered that the new ligature had been tied too firmly, kinking and stenosing the middle cerebral artery. It would seem wise to keep the basal ligature a little slack and use a transfixing suture just beyond on large sacs which have been deliberately opened. Another patient remained well until the seventh day before developing fatal massive swelling of the hemisphere. The third death followed an operation on a Grade 5 patient.

Basilar Aneurysms

Three patients with repeated bleeding from ruptured basilar aneurysms have been operated upon within 24 hours of the last hæmorrhage (Table XIII).

Two aneurysms arose from the top of the basilar bifurcation and one from the anterior aspect of the basilar artery at the origin of the superior cerebellar arteries. It was possible to occlude the neck in each case by an Olivecrona or Mayfield clip. As few of these aneurysms have been attacked directly, they are to be discussed as a separate problem in another paper.

Table XIV summarizes the results of surgical treatment in 70 cases with reference to the grading of the patient and the time interval after the last hæmorrhage. It is clear that the highest mortality and morbidity result from early operation on Grade 4 and Grade 5 patients. Six Grade 5 patients were operated upon because of known associated intracerebral clot. All died, although two were subjected to preliminary hypothermia for two and four days. Grade 4 patients gravely ill with cerebral softening and swelling are also poor risks. However, when harboring a demonstrable intracerebral clot, it is worthwhile to evacuate the clot and obliterate the aneurysm, for three of five such patients survived.

It should be recognized that surgical treatment, aside from evacuation of clot, is solely for the prevention of recurrent bleeding and may aggravate a critically swollen brain by deep retraction and promotion of further vascular spasm. Early operation, therefore, should not be considered for stuporous patients not harboring a clot. This is particularly true with ruptured anterior communicating aneurysms, for Birse and Tom[6] have shown the frequent occurrence of multiple and widespread cerebral infarctions in the brains of fatal cases, whether they were operated upon or not. Survival may be aided by careful nursing and possibly prolonged hypothermia to surmount the stage of acute cerebral swelling and softening. In many of the survivors, a persisting profound neurologic defect will militate against a delayed operative procedure.

TABLE XIV.—Bleeding Aneurysms—Results of Operation—70 Cases

	0—48 hours		*2—7 days*		*7—14 days*		*over 14 days*	
Risk	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*	*No. of patients*	*No. of deaths*
1	3	0	4	0	2	0	11	1
2	5	1	3	1			2	0
3	13	4	2	1	2	1	4	1
4	6	3	1	0	1	1		
5	6	6	2	2				
Totals	33	14	12	4	5	2	17	2

Basilar aneurysms—3 cases under 24 hours—1 death

Total of 70 patients: 23 deaths: 9 poor results

On the other hand in the presence of less severe bleeding and brain injury, early operation (<1 week) in 30 Grade 1 to Grade 3 patients resulted in seven deaths (23%) and results in five cases were classified as poor. Three of the seven deaths were due to avoidable technical errors and three of the five poor results were in Grade 3 patients with anterior communicating aneurysms. Unfortunately no comparison is possible with a similar group treated conservatively but there is no reason to believe that the results would be improved. Of importance is the fact that patients with surgically obliterated aneurysms can lead normal lives free from the dread of recurrent bleeding. Our increasing knowledge of the causes of the operative and postoperative catastrophes and their prevention will surely lower the mortality and morbidity figures considerably. It seems therefore, that patients not critically ill and those with a clot, should continue to be subjected to early angiography and operation. The security from recurrent bleeding and restoration of cerebral function makes the risk of early operation much less than that to be expected from conservative management.

Summary

The results of investigation of 189 patients with spontaneous intracranial bleeding are reviewed. Fatal recurrent bleeding occurred in 22% of patients with negative angiography. Sixteen of 21 arteriovenous malformations were operated upon with no mortality or increased morbidity. Seventy of 110 ruptured aneurysms were treated by direct surgical management, 70% within one week of the last hæmorrhage and 50% within 48 hours. The conclusion was reached that patients with ruptured aneurysms, not critically ill and those known to have a clot should continue to be subjected to early angiography and operation.

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Résumé

Les chances de survie après une hémorragie intra-crânienne (sous-arachnoïdienne) spontanée sont tellement compromises que l'intervention d'urgence doit être considérée dans un grand nombre de ces cas. Combien regrettable n'est-il pas d'observer des malades survivre à une première hémorragie pour succomber de façon inattendue quelques jours ou quelques semaines plus tard à une nouvelle hémorragie. De plus, l'intervention semble s'imposer pour conserver la vie et l'activité cérébrale dans le grand nombre de cas où un caillot intra-cérébral demeure.

La prévention de l'hémorragie récurrente est devenue un problème chirurgical de majeure importance, particulièrement dans les cas d'anévrismes rupturés, qui sont les plus souvent en cause, et les plus difficiles à contrôler. Même si l'oblitération de l'anévrisme est habituellement possible, son exposition qui requiert une rétraction profonde peut entraîner une série de phénomènes désastreux qui conduisent à l'œdème et au ramollissement cérébral massif, entraînant alors une altération profonde de la ponction cérébrale ou la mort. Malgré cela, l'intervention assure un taux de mortalité inférieur à celui de 50% qui est celui du traitement conservateur. C'est avec l'idée que la plupart des anévrismes sont petits et accessibles, qu'on se doit de rechercher d'améliorer la technique chirurgicale afin de pouvoir éliminer d'emblée la possibilité d'hémorragie récurrente.

Cette étude comprend 189 malades qui ont cliniquement été considérés, avant angiographie, comme ayant saigné d'un anévrisme ou d'un angiome intra-crânien. Seize cas d'angiome et 68 d'anévrisme furent traités d'emblée chirurgicalement: 70% de ces derniers ayant été opérés moins d'une semaine après la dernière hémorragie et 50% dans les 48 heures.

L'hémorragie sous-arachnoïdienne fut vérifiée dans tous les cas par ponction lombaire, et la distribution vasculaire démontrée précocement par une angiographie carotidienne bilatérale, complétée chez 30 malades dont l'angiographie carotidienne était négative, d'une angiographie vertébrale. (Tableaux I et II)

En deux occasions, un anévrisme fut démontré en répétant l'angiographie, d'où l'importance d'angiogrammes de contrôle après deux ou trois semaines, ou du moins, avant le congé du malade.

Une hémorragie récurrente fatale est survenue chez 22% des malades dont l'angiographie était négative. Seize des 21 cas de malformation artério-veineuse furent opérés sans mortalité ni morbidité accrue.

Il ressort, en conclusion, que les malades présentant un anévrisme rupturé et qui ne sont pas moribonds et ceux que l'on sait porteurs d'un caillot devraient continuer d'être soumis à l'angiographie précoce et à l'opération.

THE BENIGN "PHYSIOLOGICAL" BREAST DISEASES: A PLEA FOR CONSERVATIVE MANAGEMENT*

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MUCH DISCUSSION, both in the written and spoken word, has kept physicians and surgeons well aware of the controversies currently encountered in the treatment of breast cancer. In contradistinction, it seems odd that so little emphasis has been placed upon reappraisal of the therapeutic situation in benign breast disease, a process affecting a far greater number of patients, but in which few clear-cut plans for management are commonly in use. It is for this reason that repetitive emphasis upon conservation in the care of the benign process seems worthwhile.

This problem was reviewed previously[1] with emphasis on the fact that definite proof of a pre-cancerous tendency in benign breast disease was clearly lacking. Consequently, surgical mutilation appeared unwarranted.

STATISTICAL REVIEW

In this appraisal[1] of prospective studies of benign disease (including both chronic mastitis and its papillomatous intraductal variants) the incidence of subsequent cancer after local excision of a benign process appeared no greater than that to be anticipated in the general population. Retrospective studies of malignant disease similarly did not demonstrate an increased incidence of previous treatment for benign disease in the patient's past history. It was pointed out in addition that, although recurrence of symptoms after treatment of benign disease might occur in approximately 15% of cases, unilateral simple mastectomy was not an adequate solution even in this problem since, as might be anticipated, almost 50% of these recurrences affected the opposite breast.

Although recurrence of symptoms might be annoying it was, of course, the fear of subsequent cancer which led to the attempt to prevent this catastrophe by utilizing simple mastectomy as a prophylactic gesture, particularly in those diseases in which epithelial hyperplasia represented the outstanding feature of the microscopic picture. Once again the futility of such an approach was stressed with the observation that subsequent cancer was just as likely to occur in the opposite breast as in the breast under treatment. In the absence of any definite proof of a marked increased incidence of subsequent cancer, the physical and psychological mutilation of a bilateral mastectomy, which remained the only logical extension of aggressive surgical therapy, could scarcely be considered.

Subsequent literature has continued to provide support for this conservative outlook. In the statistical analyses previously reported[1] the occurrence of subsequent cancer after local excision of benign disease varied between 1% and 2% as compared to a loosely calculated incidence in the general population of 0.5% to 1%. Recent prospective studies have also failed to show any evidence of an increased incidence of subsequent cancer. Rosemond *et al.*[2] report 150 cases with cystic disease treated by aspiration in which only two subsequently developed cancer, one of which occurred in the opposite breast. Two of their patients had cancer in the cyst wall but the presence of a residual mass led to excisional therapy with immediate recognition of the associated malignant process. Care is obviously necessary in ascertaining that the lump actually disappears after aspiration. Hendrick[3] also notes 484 patients having local surgical treatment for benign disease in which group only four subsequently developed cancer, an incidence well within the range noted above. In his series, 167 had cysts aspirated with no case of late cancer recorded, and in this group seven with residual induration after aspiration showed no evidence of cancer when the area was excised.

Retrospective studies similarly provide the same kind of basic factual information. Cairncross[4] records previous cystic disease present in only 0.6% of 1544 cases of breast

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cancer treated at the Presbyterian Hospital, New York City. Hendrick[3] reports in addition 452 cases of cancer of the breast, in which group only four gave a previous history of removal of areas of benign disease. These incidences are well within the percentage range for a comparable group in the general population.

In the case of the papillary variants of benign breast disease the identical pattern continues in evidence. Hendrick[5] notes 208 cases of intraduct papilloma or benign papillary cystic disease, in which group after local treatment of the benign process only two cancers subsequently arose, both in the opposite breast. Madalin, Clagett, and McDonald[6] also record approval of the conservative treatment of nipple discharge particularly in the absence of a palpable mass.

It would appear, therefore, that as these large series of cases are carefully evaluated, and as surgeons gather thereby a wider knowledge of these benign processes, the total experience, both in the practical management of the patient and in the academic appraisal of results achieved, leads inevitably to the establishment of a plan of treatment for benign disease in which conservatism must remain the fundamental keystone.

In order to apply conservative principles properly and create practically effective therapy, one must clearly understand the basic physiology of the breast and the pathophysiology which leads to the exhibition of benign disease processes. These normal and abnormal physiological processes will now be discussed briefly.

Normal Physiology of the Breast (and Uterus)

The completely normal physiological changes produced in the breast during a normal menstrual cycle are diagrammatically represented in Figs. 1 and 2. Two features are of importance in this regard.

In the first place, as has now become accepted teaching, it would be illogical to expect a perfectly symmetrical stimulation and regression of breast tissue during each of these successive monthly cycles for the entire duration of the patient's sexual life. Irregularities must be anticipated and if they occur in localized areas they will produce the breast lumps which create one of the presenting problems of benign disease.

In the second place, the breast changes only occur in the presence of a normally functioning pituitary, and the inter-relationship between the ovary and the pituitary must be perfectly adjusted for normal breast and uterine changes to develop in the proper sequence. Experimentally, using hypophysectomized, adrenalectomized, and castrated animals, œstrogen and progesterone alone have no effect on the breast, although œstrogens will produce mitotic epithelial changes locally. Purified prolactin will carry the change only to mid-menstrual stages and both adrenocorticotrophic hormone and growth hormone are necessary in addition if full mammary development is to occur.[7] In such a complicated relationship aberrations are logically to be anticipated, and as might also be expected, since the breast and uterus respond in similar fashion as target organs for the same hormonal substances, one would logically assume that these aberrations would frequently be exhibited by correlated changes occurring simultaneously in these organs.

Abnormal Physiology of the Breast (and Uterus)

The thesis that the breast and uterus should have interrelated diseases is supported by the frequent association of mammary and uterine complaints. It has long been recognized, of course, that benign breast disease tends to occur most often in patients with menstrual irregularities and a history of sterility. There is now confirmatory evidence that the entire pituitary-gonad-thyroid axis is unbalanced in these conditions.

On the purely histological plane Martel and Sommers[8] who separate benign disease into adenofibrosis and chronic cystic mastitis (as we have also done in the past,[1] utilizing the more descriptive terms of non hyperplastic and hyperplastic disease respectively) show the frequency with which changes in these endocrine relationships may be demonstrated. They have dis-

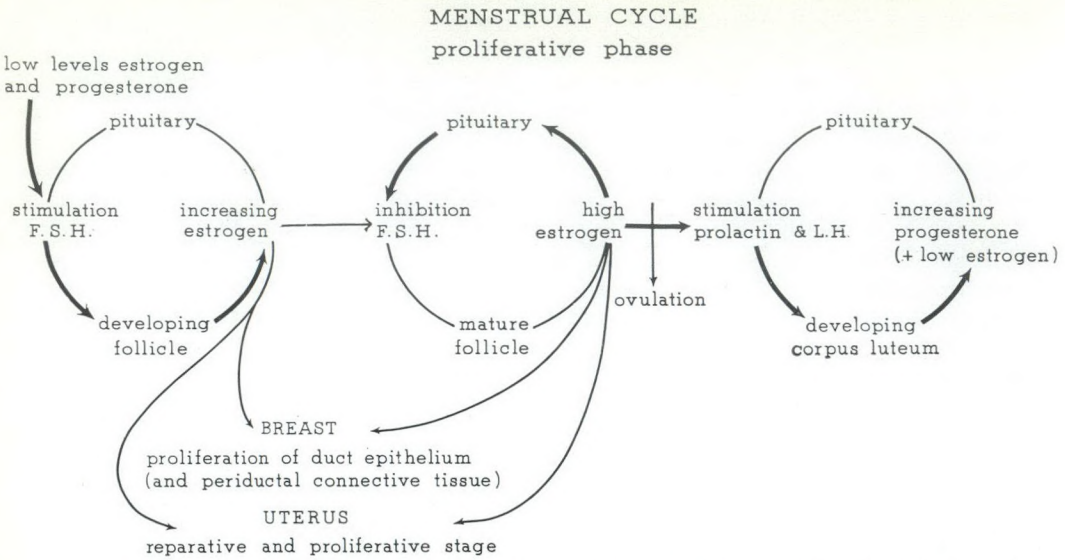

Fig. 1.—Diagrammatic representation of physiological changes produced in the breast during the proliferative phase of the normal menstrual cycle.

covered ovarian cortical stromal hyperplasia to be present in 19 of 20 cases of chronic cystic mastitis and in 17 of 20 cases of adenofibrosis, with the change less apparent in this latter group who are considered potentially to be in an early stage of the fully developed process of chronic cystic mastitis. They point out that the fact that the ovarian stroma produces œstrogen is well authenticated. Associated with the ovarian stromal overgrowth there is a pituitary basophilic hyperplasia. These pituitary cells release the gonadotrophins which produce, in addition to ovarian stromal hyperplasia, the proliferative hyperplastic uterine endometrial changes recorded in 10 of 14 cases of chronic cystic mastitis and 10 of 18 cases of adenofibrosis. This again indicates the close relationship between diseases of the breast and uterus, and also the

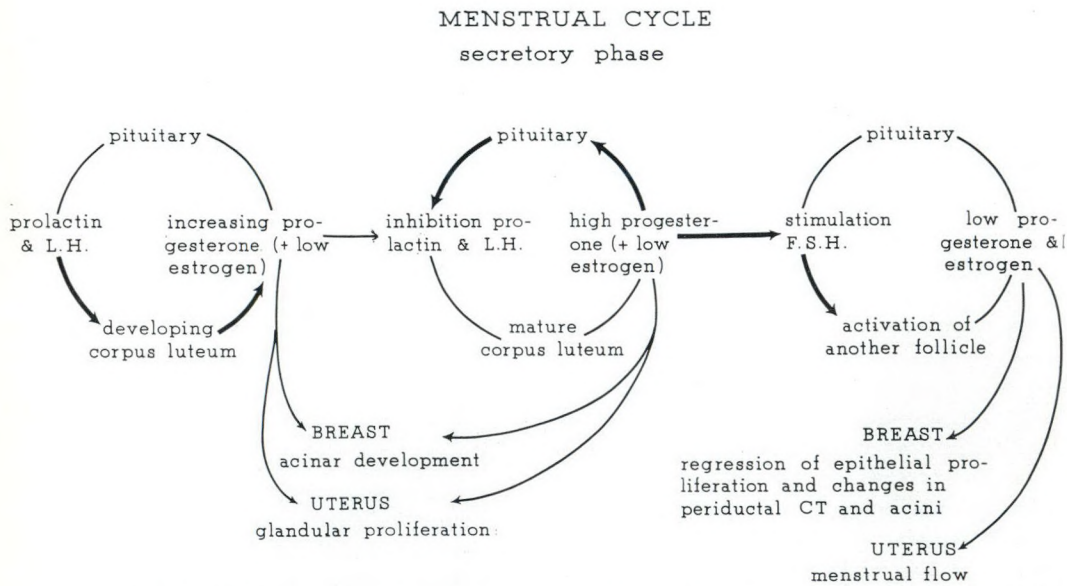

Fig. 2.—Diagrammatic representation of physiological changes produced in the breast during the secretory phase of the normal menstrual cycle.

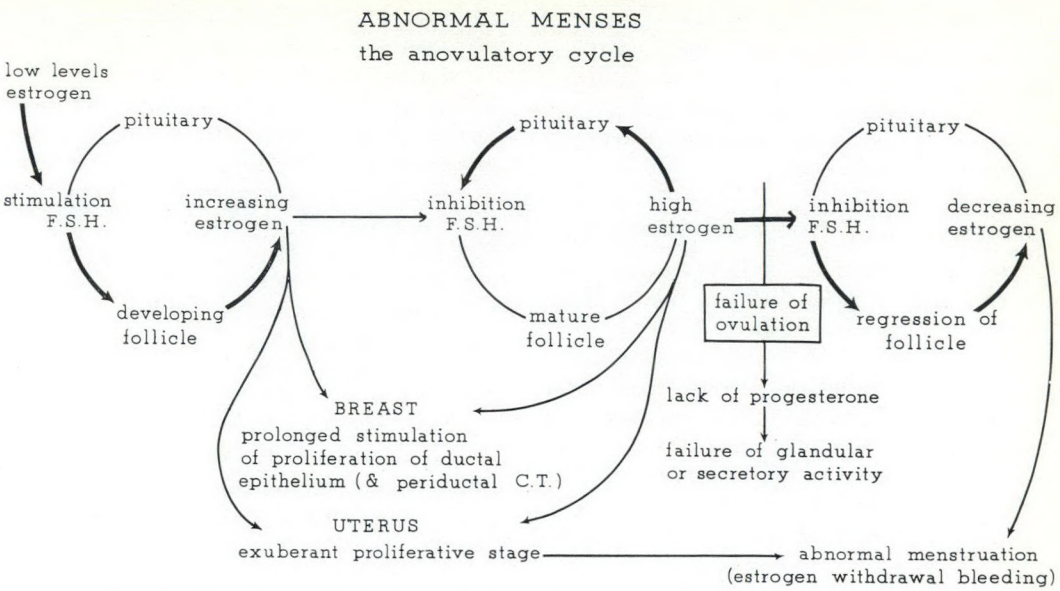

Fig. 3.—Diagrammatic representation of changes produced in the breast during an anovulatory menstrual cycle.

earlier changes to be detected in adenofibrosis. As an additional observation the thyroid was found to be abnormal in 11 of 20 cases and in these cases there was a subnormal number of pituitary amphophil cells, which cells are now known to be the source of the thyrotrophic hormone.

From the clinical and laboratory aspect of the problem additional evidence is also present to indicate the importance of this general endocrine abnormality. It has become apparent that, in the presence of any abnormality affecting ovarian function either in the nature or timing of the trophic stimulation or in the ovary itself, failure of ovulation is the first change to be detected, since in the transformation of the follicle to a corpus luteum, a delicately balanced hormone relationship is essential. The failure to produce functioning luteal bodies results in menstrual changes characteristic of the anovulatory cycle. This effect may be due to an intrinsic defect in the ovary or more probably due to a more fundamental defect in the process of œstrogen stimulation of the pituitary release of luteinizing hormone and prolactin. The nature and results of this anovulatory cycle are depicted in Fig. 3. In this case the failure to produce luteinizing hormone results in a deficiency of progesterone and, therefore, prevention of the normal maturation in the breast and uterus from the proliferative to the secretory phase of the monthly cycle. Consequently stimulation is continued, as indicated by ovarian stromal activity, until progressive inhibition of the follicle stimulating hormone removes the trophic stimulus for continuing survival of the follicle. At this stage, œstrogen levels fall, and the proliferative changes both in the breast and the uterus, which are now no longer supported by this hormonal stimulus regress with associated uterine bleeding of œstrogen-withdrawal type. Since this bleeding may be a comparatively regular cyclic process, and similar in amount and duration to normal menstruation, the patient may well be unaware that the menstrual cycle is abnormal in any way.

However, apart from the sterility which is of necessity associated with the failure of ovulation there are other indications of the frequency with which this situation is encountered. Premenstrual endometrial biopsies will show proliferative change with none of the glandular secretory activity which is dependent upon progesterone stimulation. In keeping with the lack of progesterone, which is normally metabolized in the liver, with approximately 20% to 30% excreted in the urine as pregnanediol, there will be an absence of this substance (pregnanediol) in the urine and

also a low progesterone content of the breast tissues themselves. These patients show, in addition, a monophasic temperature record in comparison with the normal diphasic temperature response during a normal menstrual cycle.

"Physiological" Breast Diseases

Although progesterone deficiency is then the fundamental physiological link in these processes, the œstrogenic stimulus, continuing in relatively high concentration, represents for practical purposes the actual "cause" of the diseases under consideration. The fact that benign breast disease does not occur in patients castrated before puberty and tends to regress when ovarian function is controlled at the time of a spontaneous or induced menopause, indicates the significance of this statement. Womack[9] points out that chronic cystic mastitis has been produced in both man and animals by excessive œstrogen stimulation and never without œstrogen. It becomes evident, therefore, that in the conservative management of benign breast disease, attention must logically be directed to minimizing the effect of this relative excess of endogenous œstrogen.

Endogenous œstrogen may produce a physiological mammary response in two ways, and in so doing, may create pathophysiological breast changes which naturally fall into two main clinical groups, although both are clearly related since dependent upon the identical basic stimulus. We have chosen to term these processes the non hyperplastic and hyperplastic diseases while recognizing their relationship as well as the suggestive evidence recorded above, that the first type may in some instances represent a precursor or early stage of the second type of disease.

Non Hyperplastic Disease (Adenofibrosis)

These changes result from the indirect effect of œstrogen on the breast as a result of its systemic biochemical action as a steroid in producing increased renal tubular reabsorption of sodium (and water) with general increase in extracellular fluid volume. This increase is possibly most noticeable in the normal target organs of œstrogen stimulation. At any rate, the increased extracellular fluid volume tends to persist and increase throughout the latter part of an anovulatory cycle, since there is no normal compensatory diuresis as a result of the progesterone release, which occurs in the last half of a normal menstrual cycle. This increasing "retention" produces painful swelling in the breast, which is normally a firm organ unsuited to volume alteration and well supplied with delicate sensory nerves which are stimulated by the attendant pressure effect. In addition, as is customary in interstitial tissue response throughout the body, the increased extracellular fluid volume causes the reactionary productive fibrosis in the extrinsic breast stroma, which may eventually develop so remarkably that the entire breast becomes quite hard and clearly delineated from the surrounding subcutaneous adipose tissue. The association of premenstrual pain with a hard saucer-like breast has generally been termed adenofibrosis. As might be anticipated, since the symptoms are due to an œstrogen-induced fluid and sodium "retention", they tend to subside rapidly and dramatically with the sudden fall in œstrogen levels that promotes the onset of œstrogen-withdrawal bleeding.

Hyperplastic Disease (Chronic Cystic Mastitis)

In this case the breast changes result from the direct local effect of œstrogen stimulation of the breast itself. With the relative increase in the concentration of œstrogen and the prolongation of its period of effective stimulation, there will be a marked increase in the degree of proliferation of intraductal epithelium and the intrinsic periductal connective tissue of the breast. Consequently, the breast tends to become ropey and nodular and, as a result of the increased number of cells sloughed into the lumen of the ducts to be liquefied by autolytic digestion, there is an increased accumulation of fluid and debris within the duct which may be forced to the nipple by pressure as a non puerperal discharge. The discharge tends to appear from several duct orifices, is often bilateral, and although occasionally a clear straw colour

in appearance, it usually has a murky or pasty nature.

The previous report[1] emphasized the fact that gross cysts (which are due to hygroscopic increase in the amount of autolyzed intraductal cellular debris) and duct papillomata (in which the epithelial hyperplasia demonstrates vascular cores) may conveniently be considered as variants of this hyperplastic mammary response.

Premenstrual Tension

Both the processes described above are frequently associated with the symptoms of premenstrual tension. Current opinion makes this a logical association since it is now felt by most observers that this syndrome, often so disabling during the premenstrual week or ten days, is largely due to the same œstrogenic stimulation of increased sodium and water reabsorption that results in general systemic increase in the extracellular fluid volume. The abnormal premenstrual weight gain in association with significant rises in diastolic and systolic blood pressure in those women with severe complaints support this contention that an extracellular fluid volume increase is the basic phenomenon here. Mazer and Israel[10] demonstrated the high level of œstrogen present during this period many years ago. Much information is now available concerning the effectiveness of measures designed to alleviate the troublesome symptoms of this syndrome, and because it is presumably produced by the very factors which initiate benign breast disease, this information should be directly applicable to the management of the problem under discussion here. Bickers[11] has reported marked improvement in 22 of 49 patients with premenstrual tension who complained primarily of breast fullness, headaches and abdominal bloating in which group, treatment with a diuretic (chlorothiazide) was started at the onset of premenstrual symptoms and continued through the first day of menstruation. The average weight gain during the treated cycle showed a remarkable fall (from 5.25 lb. to 1.75 lb.) and 20 of the 22 patients were remarkably improved. In the entire series of 49 patients only 11 failed to obtain benefit and it was felt that this was due to the fact that they were refractory to the diuretic used, since the weight loss was not as dramatic as that noted above.

Other measures utilized in the management of this syndrome, although usually based on an apparently valid rationale, have failed to produce such gratifying responses. Attempts, for example, to hasten œstrogen metabolism in the liver by administering vitamin B complex in order to maintain hepatic function at a high level of efficiency, have provided little subjective improvement, although perhaps capable of supporting the patient's general sense of well being.

More recently attempts have been made to correct the basic progesterone deficiency by using synthetic progestational steroids with a view to promoting a more normal menstrual cycle (even in the absence of ovulation). These agents, if effective, should overcome the increase in extracellular fluid volume by their action in increasing urinary excretion of sodium[12] and, of course, when supplementing the local effect of œstrogen on the breast and uterus, promote the development of a normal secretory phase. Whether or not they may, by their ability to depress pituitary luteinizing hormone, when a series of therapeutic courses is discontinued result in release of this luteinizing hormone by a rebound phenomenon with stimulation of ovulation, corpus luteum formation and spontaneous return to an ovulatory cycle, is highly theoretical. Since other factors than symptomatic relief alone have to be considered here, the period over which these agents should be given requires much thought. There seems little doubt but that they are capable of preventing ovulation in normal cycles due to this depression of luteinizing hormone,[13-15] and actually these agents are now being studied as potentially effective contraceptive measures. If one is dealing with a primary anovulatory cycle and sterility is already an established fact, one may reasonably resort to such therapy in severely disabling instances of premenstrual tension, but prevention of ovulation can scarcely be a proper emphasis in other cases. The fact, however, that ovulation occurs on discontinuing the drug may permit its use on

a temporary basis in order to establish a more normal physiological sequence. It is generally suggested that therapy be started at approximately the 15th day in order not to inhibit ovulation, if it is to occur, and continued through to the 25th day in order to produce progesterone-withdrawal bleeding at about the time when normal menstrual flow might be expected to occur. In some cases, it may be started in the pre-ovulatory period in order to effect a gradual increase in circulating levels, much as occurs in the last half of the normal cycle.

Womack[9] has recently discussed the effectiveness of a long acting agent of this type (hydroxy-progesterone caproate, 250 mg.) given only once a month by intramuscular injection to patients with mammary complaints, and he reports that in 41 patients premenstrual breast pain, nipple discharge and cyst filling usually improved within three months. This indicates again that the same principles quite properly underlie the management of these related disorders.

Management of Benign "Physiological" Breast Disease

As outlined in the previous report[1] benign disease, of the type predicated on abnormal hormonal stimulation, is exhibited clinically in three common ways; a lump in the breast, a nipple discharge, or discomfort in the breast of varying degree during the premenstrual period. Mastodynia, when used in reference to mammary pain that is not definitely premenstrual in occurrence, is coloured by psychogenic attributes and is not properly under discussion in this analysis.

The treatment of the discrete lump (including gross cystic disease) was thoroughly reviewed previously[1] and mention will be made only of the continuing emphasis on conservatism within the limits of which emphasis, one should avoid any major mutilation by advising local resection of these lumps and aspirations only in the case of cysts, provided they disappear completely after being emptied. Residual palpable induration after aspiration must, of course, be excised for pathological appraisal.

Nipple discharge is handled in similar fashion. If the discharge is bloody and apparently from a single duct, there is a 15% to 20% chance that it is due to an intraduct carcinoma, even in the absence of a palpable mass, and consequently local excision by retrograde cannulation of the duct from its nipple orifice is indicated. If the discharge is produced from several ducts and particularly if it is *not* sanguineous one may be certain that a benign hyperplastic process is involved in its development, and a conservative plan is, therefore, indicated according to the principles to be outlined below. Observation is, of necessity, advisable in order to assess the results of the therapy and to make certain that an unrelated lump does not subsequently appear in these relatively overstimulated breasts.

It is in the management of premenstrual pain, however, that the physiological principles enunciated above have clinical application within the basic principles of a conservative approach to the problem. Certainly this symptom is one of the most difficult for the physician to treat adequately in view of the continuing abnormal physiological stimulus responsible for its presence, and the unfortunate and hazardous emotional reactions on the part of the patient to whom such a complaint has only one real significance, namely that of indicating "cancer". It is necessary, therefore, to create symptomatic relief, in order to have some concrete basis for providing satisfactory reassurance for the patient. The following plan of treatment is one designed to afford such relief within the framework of the conservative approach recommended in these instances.

Treatment Programme

As in all therapeutic plans treatment begins most commonly with the measures having the least effect on the patient as a whole and progresses subsequently to measures which affect the host in a more serious way only if necessary in view of the inadequate response to the initial therapy. It is in this light that the following sequence should be viewed.

"*Support*" is the key-note of the programme; psychological support to provide emotional stability for the patient, physical support for the heavy, swollen, tender breasts, and physiological support designed

to control the systemic and local reaction to the relative œstrogenic excess. In this last instance diuretics are used to minimize the increase in extracellular fluid volume and in uncontrolled cases an attempt can be made to increase the metabolism of œstrogen using vitamin B_1 or to counterbalance its effect by exhibiting progesterone.

1. *Psychological Support*

Not infrequently this is the only measure indicated in intelligent women for whom a careful, meticulous explanation with kindly reassurance has meaningful quality. A complete physical examination has its proper place in laying the groundwork for this reassurance. Central sedation using the usual drugs, such as phenobarbital or sodium amytal, may be a useful adjunct when the patient is particularly unstable or very upset emotionally by prolonged worry concerning the significance of her complaints during the period before she sought medical advice.

2. *Physical Support*

The breasts, in these instances, are actually heavier than usual and need proper support to prevent the aching distress due to the dragging sensation produced by the traction of the pendulous organs on the pectoral fascia. Proper support does not mean merely suspending the breasts in tight brassières by narrow straps over the top of the shoulders, since this simply substitutes one complaint (shoulder distress) for the other (breast and pectoral discomfort). A correctly fitted brassière is essential in these cases and may need to be individually fashioned with a broad band around the lower chest and adequate strengthening of the lower part of the cup to support the weight of the breast above this fixed circumferential band without excessive traction across the shoulder top. Protection is, of course, also necessary at this period in order to avoid the pain of actual trauma to the tender, swollen breast and the brassière itself should be tight enough to prevent unnecessary motion of the affected breast.

3. *Physiological Support*

In this instance one attempts by various measures to overcome the local effect of the relative excess of œstrogen and the attendant stimulation of increased renal tubular reabsorption of sodium and water which produces the change in the extracellular fluid volume. These measures are most important during the 10 day period immediately before the onset of menstrual bleeding when the unopposed œstrogen effect is at its peak.

(a) *Use of diuretics.*—As noted above chlorothiazide (250 mg. to 500 mg. b.i.d.) and hydrochlorothiazide (50 mg. b.i.d.) have recently been used with striking success in the control of the excessive premenstrual weight gain so commonly encountered in these patients. This type of diuretic appears unequivocally the most effective yet discovered for this specific purpose. Dietary salt restriction during this period is, of course, an important contributory factor in the success of this therapy, but does not need to be as rigid as in the enforcement of this measure in cases of extreme myocardial insufficiency.

(b) *Use of vitamin B complex.*—Vitamin B_1 is considered to expedite the hepatic metabolism of circulating œstrogen but it merely assures that a normal process *can* take place. It does not really attack effectively the fact that there is a relative (and probably absolute) increase in the amount of œstrogen circulating in these cases. A dramatic response would not therefore be anticipated but occasional reports of symptomatic relief may encourage a trial of this therapy in cases not responding satisfactorily to the above measures. A daily level of 20 mg. to 25 mg. of thiamin hydrochloride in divided doses is considered an adequate amount when given, as is customary, during the latter half of each menstrual cycle.

(c) *Use of progesterone.*—Progesterone will not only help to overcome the renal tubular reabsorption of sodium and water thus diminishing the increase in extracellular fluid volume but it will also tend to produce a more normal sequence of changes from the proliferative to the secretory phase not only in the breast but also in the uterus. It might be expected consequently to improve the symptoms and signs of hyperplastic breast lesions as well as to provide relief from the pain associated

with non hyperplastic processes. Precautions in its use are necessary in order to protect ovulation, (if there is any indication that it is taking place) although most commonly it will be used only in those with anovulatory cycles.

Originally progesterone was available only for injection and this hampered its clinical application since daily administraton of 5 mg. to 10 mg. intramuscularly was considered the proper dosage level. However, oral preparations are now available and synthetic steroids have been prepared with progestational effects.

Both the oral preparations and the synthetic steroids are prepared by the manufacturer in 10 mg. doses and generally it is suggested that proper therapy should consist of one tablet once or twice daily from the midmenstrual or ovulatory period to approximately the 23rd to 25th day in the usual 28 day cycle, in order to permit progesterone-withdrawal bleeding to develop on schedule.

(d) *Use of androgens.*—Androgens are used with a view to producing pituitary depression of trophic stimulation of ovarian œstrogens and thus a diminution in their effect as the amount of endogenous œstrogen falls. Unfortunately, exogenous androgens are metabolized through a stage of biologically effective œstrogenic substances and these "exogenous" œstrogens are capable therefore of producing the same changes as the endogenous hormones so that the effectiveness of the therapy may not be apparent. Only occasionally is this type of treatment now considered worthwhile, but when all other measures fail, the use of linguets may in these rare instances provide the symptomatic relief required. It is customary to advise one linguet daily during the last half of the menstrual cycle as is true of the timing of the other measures described above.

(e) *Contraindications to œstrogen therapy.*—The use of œstrogen in symptomatic breast disease is clearly contraindicated. One might well digress to point out that careful consideration should be given to the use of œstrogens in the treatment of menopausal symptoms and the postmenopausal signs and symptoms of œstrogen deficiency. Hendrick[3] stresses the fact that since 1940, 60% of the patients in his series having cystic disease or breast cancer have had previous œstrogenic therapy. This is in keeping with the logical assumption of the hazard of such treatment if these diseases are actually due to circulating œstrogen. Prolonged œstrogen administration has certainly produced mammary carcinoma in the male and is to be rigorously avoided in the high dosage here designed for pituitary depression. However, others feel that it has not, in limited dosage, produced any real increase in the incidence of breast tumours and that its benefit far outweighs its hazards.[16, 17] Nonetheless, the author does not feel that its use is warranted in these instances when other measures can be utilized.

Summary

The benign "physiological" breast diseases are *not* proven to be precancerous. Conservative management is, therefore, indicated. The normal and abnormal physiology of the breast (and uterus) are reviewed. The importance and frequency of the anovulatory cycle in producing symptomatic disease is noted.

The clinical syndromes appear to result from relative (or absolute) increase in œstrogenic stimulation of the breast. The benign breast diseases due to this factor fall into two groups; the non hyperplastic and the hyperplastic processes both of which are closely related to the syndrome of premenstrual tension since they all have in common the same basic ætiological relationships.

The principles of management of these benign "physiological" processes are outlined with a summary of one treatment programme designed to overcome and correct the basic fault responsible for the production of symptoms.

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Résumé

Il n'est pas prouvé que les maladies bénignes "physiologiques" du sein soient pré-cancéreuses, d'où l'indication d'un traitement conservateur qu'on ne peut instituer que si on comprend la physiologie de base du sein et la physiopathologie que les maladies bénignes manifestent.

Les changements physiologiques au niveau du sein durant le cycle menstruel sont représentés dans le Figs. 1 et 2. Il est, en premier lieu, illogique de penser que les changements au niveau du sein seront des plus symétriques, cycle après cycle, durant toute la durée de l'activité génitale chez un même sujet. Il se produira des irrégularités et, selon leur localisation, des masses apparaîtront. En second lieu, les transformations mammaires ne surviennent que si l'hypophyse fonctionne normalement, et pour ce faire, nécessitent l'ajustement parfait de l'interrelation "hypophyse-ovaires". A cause de cette complexité, des aberrations peuvent être anticipées, et comme l'utérus et les glandes mammaires sont stimulés par les mêmes hormones, elles se rencontrent simultanément au niveau de ces deux organes, d'où l'association clinique fréquente des maladies mammaires avec les irrégularités menstruelles et la stérilité. Quoique la déficience en progestérone soit la cause déclenchante de l'inachèvement ou du dérèglement du cycle menstruel, pour toutes fins pratiques, c'est la concentration continue relativement élevée d'œstrone qui devient causale des maladies qui nous intéressent.

Dans la maladie non-hyperplasique (adénofibrose) les changements sont d'origine œstrogène indirecte, en tant que "stéroïd" produisant une augmentation de réabsorption de sodium (et d'eau) par les tubules du rein, avec accroissement du volume extracellulaire qui persiste dû à l'absence de diurèse compensatrice par excrétion du progestérone. Cette rétention se traduit cliniquement par le gonflement douloureux des seins et la réponse se manifeste par l'apparition de fibrose réactionnelle.

La maladie hyperplasique (mastite kystique chronique) d'autre part, résulte de l'effet direct local de la stimulation œstrogène sur le sein. Il se produit une prolifération anormale de l'épithélium et du tissu conjonctif péricanaliculaire. Le sein devient granuleux et nodulaire et l'accumulation de cellules autolysées dans les canaux est cause des écoulements mamelonnaires non physiologiques.

Le *support* constitue le point fondamental du traitement: le support psychologique afin de rétablir la stabilité émotionnelle, le support physique des seins pesants, enflés et douloureux et le support physiologique pour contrôler la rétention systématique et locale du à l'excédent œstrogène relatif. Sous ce rapport, les diurétiques sont employés pour diminuer l'excès du volume extracellulaire et dans les cas rebelles on peut tenter d'augmenter le métabolisme d'œstrone par la vitamine B_1 ou de contrebalancer son effet par addition de progestérone.

ADRENALECTOMY IN THE MANAGEMENT OF METASTATIC MAMMARY CARCINOMA: A FINAL EVALUATION OF 80 CASES

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A PRELIMINARY report[1] has already been presented concerning the results achieved by total œstrogen deprivation in the management of the end stages of disseminated breast cancer in a trial series of 32 patients. In this group all other methods of treatment had been tried previously and the major extirpation had been delayed until the metastatic disease was again active and progressive. No other potentially effective therapeutic tools were available. Consequently, the majority of the group so treated were in desperate straits with a limited life expectancy during which the patient faced grave and often totally disabling symptoms. The effectiveness of the procedure had to be assessed against this dreadful background.

It was in this connotation that Cade[2] referred to adrenalectomy as one of the most successful tools ever devised in the treatment of advanced malignant disease and in which sense Block *et al.*[3] have also more recently stated that "the endocrine ablative procedures have consistently given the highest percentage of success and the most profound remissions."

This type of enthusiasm has stimulated further interest in major extirpative therapy (including adrenalectomy and hypophysectomy) largely directed along the two important lines of study that are discussed below.

STAGE AT WHICH MAJOR EXTIRPATION SHOULD BE USED

In the first place the undoubted success of these operations when applied in the end-stage of the disease when the outlook is otherwise hopeless, quite logically begs the question concerning their application earlier in the course of the disease. Because cancer of the female breast is generally one which qualifies as a "good cancer" in the sense that the delicate balance between the invasive potential of the tumour and the resistance of the host is maintained in a relatively stationary and self imposed truce for long periods of time, it has been our policy to emphasize the importance of *sequential therapy* in these instances. This permits evaluation of the effectiveness of conservative measures which may offer some clinical information regarding the potential value of the major extirpation before one resorts to more serious therapeutic manœuvres of this type. The rationale of this philosophy of treatment in such instances has been reviewed in detail in previous publications.[4, 5]

In brief, it is thought that in these cases, in which the natural history of the disease is prolonged, factors inherent in the intrinsic growth and development of the tumour itself are of importance in determining this delay in tumour progression, in addition to the biological equation balancing biological aggressiveness of tumour against host resistance. In this sense the lethal, stem-line, or autonomous cell within the variegated tumour cell population is considered in competition with its siblings of dependent and less aggressive type for essential nutritive substances. If the lethal cell is in the minority quantitatively, it must exert all its energy for local survival when faced with this competition, and has no reserve with which to undertake invasion and destruction of host tissues. Sequential therapy envisages an attempt to maintain some semblance of this intratumour control by adversely affecting at any one time only a sufficient number of dependent cells to provide palliation while leaving others to continue the battle for survival with the autonomous cells in each local tumour conclave. It is thought that when applying therapeutic measures of this type in succession one after the other as the effectiveness of each individual procedure wears off, the cumulative longevity achieved will surpass that produced by an all-out attack on the sensitive components of the tumour population. In such a major attack one might anticipate a major destruction of the dependent cells leaving the potentially lethal cells now unopposed by any intratumour

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competition and, therefore, capable of transferring their energies previously expended of necessity for this purpose, into the pathways of host destruction. Since there has been no suggestion in any of the literature to date that hormonal alteration of the internal tumour environment can ever completely destroy these autonomous cells, one must always consider such treatment as a purely palliative gesture and adjudge its effectiveness in this connotation. The possibility of effecting "cure" of the disease in its metastatic phases does not appear pertinent in the present discussion.

An attempt is made in the accompanying figurative demonstration (Fig. 1 a, b, c, d and e) to illustrate these speculative considerations diagrammatically. While originally designed approximately a decade ago as a form of acceptable mental gymnastics in attempting to explain sequential therapy of this type when teaching the principles of cancer treatment, it is important to point out that objective support for these assumptions concerning the nature of tumour cell populations is now available.[6] The possible importance of variations in chromosome number in determining the biological nature of the tumour cell has also been reviewed recently.[4]

At any rate these originally hypothetical assumptions supported by such speculative mathematics as those reported by MacDonald and alluded to in previous publications[5] led us to continue reserving adrenalectomy, throughout the entire series under present review, for use at this late stage of the disease.

Nonetheless, it is only fair to digress for a moment to point out that breast cancer is not invariably a "good cancer" even in its early primary demonstration. It does occasionally exist as a "bad cancer" in which event the entire sequence of intratumour degradation of dependent cells, replacement by aggressive autonomous cells, invasion of the host by lethal cells, and eventual destruction of the host is accelerated enormously to produce an early fatal outcome. In these instances obviously an unvarying emphasis on sequential therapy would be ridiculous and the proper emphasis in treatment turns to one of more forceful application of any or all available measures.

The so called "acute" breast cancer is probably the most acceptable example of this type of "bad cancer" in mammary neoplasia. Treves[7] points out the lethal nature of this type of disease and the complete failure of radical local surgery to control the local growth or affect the eventual outcome. Stress is properly placed also on the fact that "acute" carcinoma does *not* include all cases demonstrating peau d'orange but is reserved for those with an erysipeloid reaction of the overlying skin in which redness and palpable marginal induration are the predominant features. Recent evidence[8] rather suggests that this reaction is fundamentally one of hypersensitivity thus implicating again the immune responses of the host now recognized of such importance in maintaining effective and prolonged control of tumour progression.[4] In appreciation of the hazard to the patient harbouring this specific lesion, and realizing the futility of accepted methods of managing the primary disease, Dao and McCarthy[9] report the results of total œstrogen deprivation when employed as the initial therapeutic gesture. In their group two or three cases of primary disease capable of evaluation showed prompt regression with one surviving 29 months without evidence of progression of the disease. They report also five patients with secondary inflammatory carcinoma treated in the same fashion, of whom three had an objective remission lasting in one case three and one-half years. No other method of treatment seems nearly as effective but since the number of cases available for comparison is so small, Fitts[10] quite correctly points out that before valid conclusions may be drawn, random sampling of a large series is essential. A co-operative effort by several centres with central statistical control seems clearly indicated if one is to answer properly this important question of determining what procedures might prove worthwhile for the patient with "bad cancer".

Type of Patient in Whom Major Extirpation may be Used

The present adrenalectomy series was

HYPOTHETICAL DIAGRAMS OF TUMOUR CELL POPULATION

Potential effect of graduated therapy

INITIAL TUMOUR CELL POPULATION

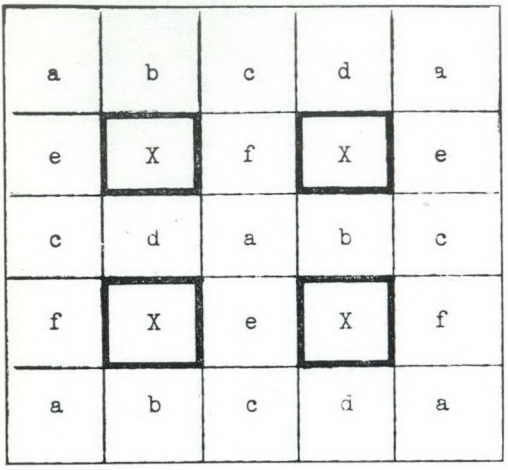

Fig. 1a.

$$\text{Ratio}\ \frac{\text{dependent cells}}{\text{autonomous cells}} = \frac{21}{4}$$

Each autonomous cell completely surrounded by dependent cells.

INITIAL THERAPY
(usually most effective)

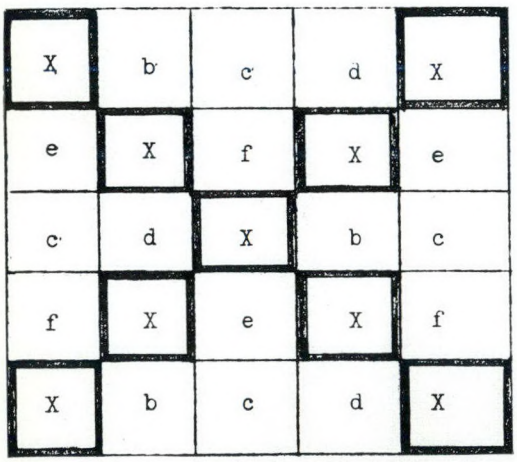

Fig. 1b.

$$\text{Ratio}\ \frac{\text{dependent cells}}{\text{autonomous cells}} = \frac{16}{9}$$

Each autonomous cell still has dependent cell neighbours.

ADDITIONAL THERAPY
(further destruction of dependent cells)

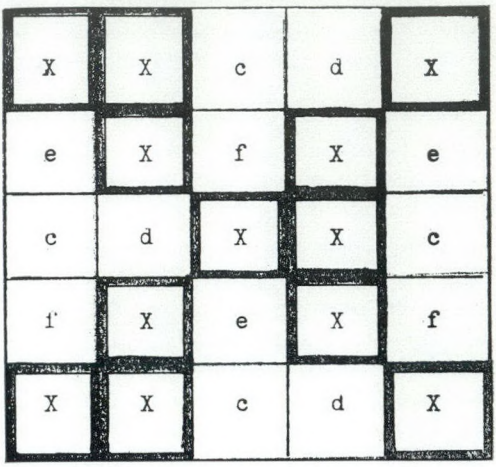

Fig. 1c.

$$\text{Ratio}\ \frac{\text{dependent cells}}{\text{autonomous cells}} = \frac{13}{12}$$

Clumps of autonomous cells beginning to appear.

FINAL THERAPY
(vigorous unaffected autonomous cells replace destroyed dependent cells)

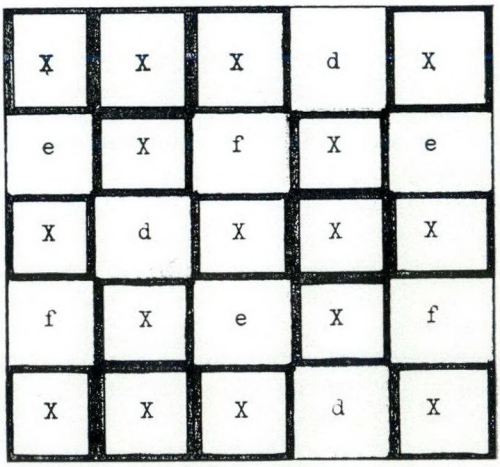

Fig. 1d.

$$\text{Ratio}\ \frac{\text{dependent cells}}{\text{autonomous cells}} = \frac{9}{16}$$

Balance now in favour of autonomous cells.

RAPID PROGRESSION
(despite treatment)

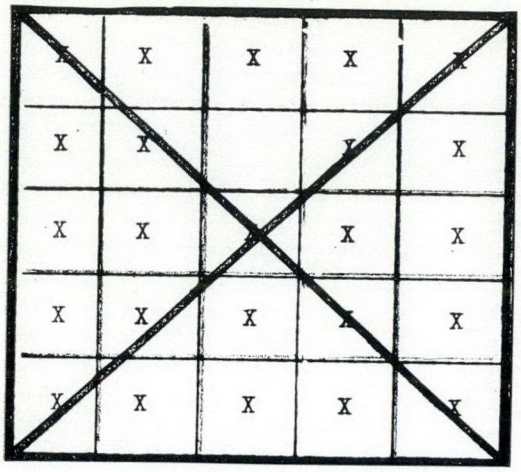

Fig. 1e.

Proliferation of fully autonomous lesion (capable of destroying own dependent cells).

Fig. 1a, 1b, 1c, 1d and 1e.—As a result of the initial therapy the most sensitive (and most numerous cells) (type "a") are destroyed. Hence there is appreciable regression of tumour mass and resultant improvement in symptoms and signs until eventual replacement of these cells by the autonomous group (type "X").

Additional therapy may affect other sensitive cells (type "b") to produce remission. Subsequently replacement by autonomous cells results in clumping of the type "X" cells into colonies for more effective proliferation.

The final therapy affecting the majority of the remaining dependent cells (type "C") results, on replacement proliferation of the autonomous cells, in a tumour population now heavily weighted in favour of these aggressive "X" cells.

Rapidly thereafter any persisting sensitive cells (types "d", "e" and "f") may disappear by the process of biological and physiological degradation to leave a fully autonomous and, therefore, lethal tumour.

KEY

X = autonomous tumour cell

a, b, c, d, e, f = dependent tumour cell

cf. TOTAL THERAPY
Combined use of many or all available methods of treatment.

If successful in eradication of all dependent cells may leave autonomous cells without restraint of competition with other types of tumour cells. It may therefore have stimulated the early appearance of an aggressive lethal tumour.

established in three stages. A preliminary study of adrenalectomy and oophorectomy in 32 cases previously reported[1] was evaluated in an attempt to create clinical indications for the procedure. The second stage involved an additional 48 patients in which total œstrogen deprivation of this type was performed keeping in mind the indications previously developed. Quite naturally the indications were not made absolute since the evidence was not in any way conclusive. Nonetheless, the incidence of definite objective improvement rose from 40.6% in the initial series to 50% in the entire group under assessment when these basic fundamental policies were recognized. The third stage, to be completed before publication of the final evaluation of the procedure, included a follow-up of the patients until they eventually succumbed to the disease, in order that firm figures for length of objective remission and total survival could be determined. Consequently, after completing the treatment of these 80 cases the study was terminated until the present report could be prepared.

It is encouraging to note how well the clinical indications originally established[1] have stood the test of time. On physiological grounds it is, of course, clearly recognized that ovarian function must be controlled when adrenalectomy is performed in order to prevent subsequent trophic stimulation of ovarian œstrogens.[5] In general it is accepted that castration is indicated up to the age of 60 at least. A prior castration followed by objective remission is an indication that further œstrogen deprivation by adrenalectomy may be expected to provide another period of palliative relief.

The clinical considerations suggested earlier to be of importance might be sum-

marized as follows:—

1. A previous trial of all other available methods with uncontrolled disease at the time of considering adrenalectomy.

2. A long history of disease from the initial recognition of the primary lesion to the presenting situation.

3. A favourable response to previously exhibited therapy indicating a delicate balance between the tumour activity and the host resistance, which can be easily tilted in favour of the host.

4. A remission after castration was considered a particularly favourable feature.

5. The presence of metastases principally involving the skeletal or local soft tissues, with the vital organs (and particularly the liver and the central nervous system) free of clinical disease.

6. The occurrence of such end-stage disease in a person considered to be a psychologically suitable candidate for additional major surgery.

Of particular interest in this regard is the recent report by the Ann Arbour Group[3] which in essence presents the same conclusions. They stress, as we have done in the past,[5] that careful restriction in the use of adrenalectomy is mandatory in view of the adverse effect of the procedure if the patient does not show a marked objective remission. They suggest its use only if there is no evidence of liver involvement, if there has been a previous response to oophorectomy, and if there is a prolonged duration of the disease (over 3 years) with the patient preferably in the age group between 50 and 60 years. As an additional feature of importance the prognostic significance of high urinary œstrogen levels is noted.

In this latter regard the value of laboratory investigations to date has proved limited and often disappointing. The œstrogen stimulation and the cortisone inhibition tests[11] have not been widely applied because the lack of response did not prove to be an absolute indication of tumour autonomy and the hazard of hypercalcæmia in patients with dependent skeletal lesions is considered to be very real. The biological methods of assay of urinary œstrogens are unreliable, sometimes even in skilled hands, and consequently chemical techniques of measuring urinary œstrogens are necessary. Block *et al.*[3] have turned to paper chromatography and suggest that success may be achieved in roughly two-thirds to three-quarters of the patients if operation is restricted to those who excrete relatively large amounts of urinary œstrogen. Palmer and Helstrom,[12] on the other hand, have used chemical methods without determining any clear-cut indication of the result to be anticipated. Vaginal smears with cornification indicating the presence of biologically effective œstrogens have similarly not proven universally acceptable. Despite the need for a definitive test of prognostic value we are still faced with the problem of making the decision to utilize major extirpative therapy largely on the clinical grounds previously outlined.

Results of Total Œstrogen Deprivation:

(*Adrenalectomy Alone or with Oophorectomy*)

The present survey follows the patients on whom these procedures were performed (Table I) up to the end of 1958 so that no patient was followed-up for less than one year. Only three patients were alive at this time (49 months, 46 months, 42 months) although one had demonstrated recurrent disease. It was felt that their inclusion in a final report would not significantly affect the accuracy of the average remission and survival periods quoted below.

The same indications pertain in the selection of cases for treatment as were outlined in the preliminary report, and identical conclusions were drawn as to the type of disease most likely to be helped in a worthwhile manner. A prolonged period between the recognition and treatment of the primary lesion and the consideration of adrenalectomy represented the most favourable situation, although in two cases it was found that success with previous therapy

TABLE I.—Incidence of Adrenalectomy

Year	*Number of cases*
1953	19
1954	31
1955	17
1956	7
1957	6
Total	80

had created a completely autonomous lesion which failed to respond to the operation as had been anticipated. In no instance did we observe frank exacerbation of the lesions as had been suggested might theoretically occur were the mammotrophic complex to be released by the ablation of adrenocortical inhibition of the pituitary. It is quite possible that this is due to the policy followed in this series of restricting the major extirpations to end-stage disease in which event exacerbation, if it did occur, would scarcely be detectable clinically since worsening of the patient's condition might well not be apparent.

In this series a strictly clinical preoperative evaluation was utilized in the selection of suitable patients. It was not possible to evaluate the usefulness of calcium excretion studies, the stilbœstrol stimulation test, or the cortisone inhibition test, nor were endocrine assays used with measurement of gonadotrophins or œstrogens. The possible value in prognosis of estimating steroid metabolites has previously been mentioned and undoubtedly all these methods may be useful in isolated cases in choosing suitable candidates for major extirpative therapy. However, the proven ability of the host to contain the neoplasm remains the single most important factor influencing clinical judgment concerning this procedure.

1. *Mortality and Morbidity Statistics*

The accompanying tabulations summarize the experience developed in this group of patients. The mortality (Table II) and morbidity (Table III) attendant upon a major operation of this type in such ill patients is not excessive and most of the deaths resulted from steady progression of the unaffected disease. No operative catastrophes are recorded but several of the early postoperative deaths might be attributed to the additional insult of the operation and the anæsthetic. As is customary, deaths up to the end of the first postoperative month have been included in the mortality rate, but in these late fatalities the end result could scarcely be considered a complication of the surgical procedure, except in the single case in which we were unable to control a persistent sodium deficiency. Perhaps with the 2-methyl 9-α-fluoro corticoids now available this catastrophe might have been avoided, although it occurred in a patient failing to show other evidences of a successful result. Two of these patients were particularly unfortunate as they both had dramatic sub-

TABLE II.—Postoperative Mortality

Within one month
1st day—respiratory insufficiency—extensive pulmonary metastases.
2nd day—respiratory insufficiency—extensive pulmonary metastases.
10th day—sudden death—? collapse vital centres.
10th day—progression of disease.
11th day—cardiovascular collapse: dyspnœa: supraventricular tachycardia.
13th day—perforated duodenal ulcer (unrecognized before autopsy).
14th day—cerebral anoxia with coma (following first stage of two-stage adrenalectomy with oophorectomy).
16th day—cardiovascular collapse—malignant pleural effusion, gross hepatomegaly (metastatic).
At end of first month
—Progressive cerebral metastasis.
—Progression of disease complicated by postoperative parotitis and hæmaturia.
—Persistent Addisonian state not controlled.
—Recurrent hypotensive crises (myocardial disease). BUT dramatic relief of pain.
—Spontaneous paradox of thoracic cage (pathological fracture) BUT dramatic relief of pain.
TOTAL 13 deaths in 80 cases: mortality rate of 16%.

TABLE III.—Postoperative Morbidity
(within 1 month)

1	Wound dehiscense—stitches removed in error on third postoperative day.
1	Tension pneumothorax at 48 hours (treatment: aspiration).
1	Postoperative parotitis (treatment: radiotherapy) with hæmaturia (treatment: suprapubic cystotomy).
	Postoperative Complications (after 1 month)
1	Addisonian with extensive skin pigmentation.
2	Recurrent Addisonian crises.
1	Sensitive to cortisone. Adequately maintained on hydrocortisone.
1	Died of unrecognized tension pneumothorax following radioactive collodial gold injection (operation ineffective).
1	Disease reactivated by accidental injury to bony metastases at 6 months. (Excellent remission following operation).
1	Died of cardiac infarct at five months. (Excellent remission following operation).
1	Suicide at five months (lævo-dromoran). (Operation ineffective).

jective relief of osseous pain only to succumb in one instance to myocardial disease and in the other to a mechanical problem associated with spontaneous pathological rib fractures and instability of the chest wall.

The morbidity within the first postoperative month, and the complications encountered after the first month are unimpressive since a direct causal relationship between the adrenalectomy and serious complaints could not be firmly established (Table III). The Addisonian patients might well be adequately controlled by the newer synthetic steroids, although it is interesting to record that failure to control the underlying disease was an invariable accompaniment of this problem.

2. *Postoperative Survival*

The present report deals primarily with the actual results obtained and therefore, the period of remission and the length of survival are the two features in which we were most interested.

The survival periods in the 67 patients surviving the operation are enumerated in Table IV, each entry noting the closest month at which death resulted. Only three patients had any additional treatment, in each instance a hypophysectomy from which no apparent additional benefit was detected, and it was not thought that the length of survival was prolonged in these instances. Three of the group are still alive, all at approximately the four year period, although one of these now shows evidence of reactivation of the disease. It is interesting to note that nearly 40% of the patients lived longer than one year from the date of the operation despite their desperate state immediately before the surgical procedure. The general picture of the survival pattern is summarized at the foot of Table IV.

The average survival times are next compared in Table V dependent upon the type of clinical response to the procedure. Subjective remissions include relief of pain, dramatic improvement in the patient's sense of well being, control of dyspnœa etc., whereas objective improvement implies some measurable alteration in the size of

TABLE IV.—Survival Period after Œstrogen Deprivation

Adrenalectomy ..... 40 cases
Combined adrenalectomy and oophorectomy ..... 27 cases

First year months	*Number*	*Following adrenalectomy*	*Following combined adrenalectomy and oophorectomy*
1	2	2	0
2	7	4*	3
3	2	1	1
4	2	1	1
5	2	1	1
6	4	4	0
7	5	4*	1
8	2	0	2
9	4	3	1
10	3	2	1
11	2	0	2
12	1	1	0
Totals	36	23	13
Second year months			
13 - 15	6	2	4
16 - 18	5	3	2
19 - 21	4	3*	1
22 - 24	4	2	2†
Totals	19	10	9
Third year months			
25 - 27	5	4‡	1
28 - 30	3	1	2
31 - 33	0		
34 - 36	0		
Totals	8	5	3
Fourth year months			
37 - 39			
40 - 42	2		2
43 - 45			
46 - 48	2 (1 at 49 months)	2	
Totals	4	2	2

*Previous surgical oophorectomy in one patient of each group (three patients).

†1 patient had hypophysectomy two months before death.

‡2 patients had hypophysectomy five months before death.

SUMMARY:—36 patients died in the first year.

BUT
31 lived longer than one year.
(38.75% of entire group of 80 cases).
20 lived longer than one and one-half years.
12 lived longer than two years.
4 lived longer than three years.
1 lived longer than four years.

AND
3 patients are still alive.
one at 49 months
one at 46 months (with disease)
one at 42 months.

TABLE V.—Comparison of Average Survival Times After Œstrogen Deprivation

Clinical response	Total group (80 patients)			Series exclusive of postoperative deaths (67 patients)			
				Adrenalectomy (40 patients)		Combined adrenalectomy and oophorectomy (27 patients)	
	Number of patients	Percentage	Average survival time in months	Number of patients	Average survival time	Number of patients	Average survival time
Postoperative mortality	13	16.25	<1				
No subjective or objective remission...	15	18.75	4.1	7	months 4.1	8	months 4.1
Subjective remission but no objective change..	12	15	8.7	11	8.6	1	10
Both subjective and objective remission...	40	50	19.5	22	19.0	18	20.1
Totals.....	80	100	Exclusive of postoperative deaths 14.1 months (67 patients)	40	13.7	27	15

palpable disease or in radiologically detectable pulmonary metastasis, radiological healing of osteolytic disease or resorption of effusions. If no definite evidence of this type could be discovered despite the clinical impression of a favourable response the patient was considered to show subjective improvement only. In comparing adrenalectomy, and adrenalectomy plus oophorectomy, one is impressed that the comparative figures for the two procedures utilized are so similar, implying that the actual degree of œstrogen deprivation provided in each instance is also similar. As in the previously reported series adrenalectomy alone was reserved for those patients who were at least five years beyond the last evidence of menopausal symptoms of any type. Recent evidence[13] that ovarian activity persists for longer periods than this, might suggest that the oophorectomy should also be an integral part of the programme until the age of at least 60 years.

Those patients who demonstrated no improvement at all showed identical survival periods of 4.1 months with seven patients in one group and eight in the other. Only in the portion of the entire group who showed subjective but no objective remission is the series unbalanced, with a preponderance of the 11 cases undergoing adrenalectomy and only one having also a bilateral oophorectomy. However, the survival periods did seem similar with a definite improvement noted when compared to those who failed to respond in any way, suggesting that the extirpation did have a favourable (although limited) influence on the pattern of survival.

A striking increase in the length of survival is apparent as might be anticipated in those who showed definite objective signs of regression of the metastatic disease. Here again the series is fortuitously well constructed with 22 patients in one group and 18 in the other and as in the other comparisons the total survivals were almost identical averaging 19.5 months. It is worth noting that this group represented 50% of the entire series indicating that an appreciable degree of œstrogen dependence persists in many of these cases despite all the various methods that had been utilized in the management of the problem previously. In none of the patients in this series was there any evidence that the œstrogen deprivation resulted in exacerbation of the disease, as does occasionally occur in additive hormonal therapy. Isolated instances have been reported following adrenalectomy and oophorectomy in which exacerbation did occur presumably due to the release of the mammotrophic complex (prolactin and/or growth hormone) but this complication has not been recognized in this series.

The fact that those showing objective improvement only rose from 40% in the initial trial series to 50% in the entire group, indicates the difficulty in selecting

TABLE VI.—Comparison of Duration of Remission and Survival Time

Total Group

(exclusive of postoperative deaths)

Clinical response	*Number*	*Average remission (months)*	*Average survival (months)*	*Survival after reactivation (months)*
No subjective or objective remission	15	0.0	4.1	4.1
Subjective remission but no objective change	12	2.75	8.75	6.0
Both subjective and objective remission	40	14.0	19.5	5.5
Totals	67	8.8	14.1	5.3
Adrenalectomy (40 patients)				
No subjective or objective remission	7	0.0	4.1	4.1
Subjective remission but no objective change	11	2.7	8.6	5.9
Both subjective and objective remission	22	15.1	19.0	3.9
Totals	40	9.0	13.7	4.7
Combined adrenalectomy and oophorectomy (27 patients)				
No subjective or objective remission	8	0.0	4.1	4.1
Subjective remission but no objective change	1	3.0	10.0	7.0
Both subjective and objective remission	18	12.7	20.1	7.4
Totals	27	8.6	15.0	6.4

favourable cases on clinical grounds alone, although the same general indications were still apparent in the final analysis. Continuing attempts to evaluate laboratory means of demonstrating persistence of œstrogen dependence are, therefore, essential in trying to make certain that a major extirpative procedure of this type is offered only to those for whom a reasonable expectation of success is held. Certainly the patient who fails to respond is made worse by these procedures in the sense that she is then less able to react favourably to intercurrent stresses as well as being less capable of managing the terminal stages of the disease itself.

3. *Postoperative Remission*

Prolongation of life alone, of course, cannot be considered worthwhile palliation even if associated with objective evidence of regression of the disease, unless relief of suffering is also associated with the favourable response.

In Table VI an attempt is made to distinguish the length of remission during which the patient remained relatively asymptomatic and also the period of survival after symptomatic (or objective) reactivation of the disease. In those with subjective improvement only, the close similarity persists in the pattern noted above, with palliation averaging 2.75 months and survival after reactivation six months. When objective changes were detected, palliation was effective for an average of 14 months, again a striking improvement of similar degree in both methods of treatment under comparison. It is interesting to note that the survival after reactivation however, even in this favourable group, remains only 5.5 months and closely resembles the period of six months, when only subjective improvement occurred, and also the survival of 4.1 months when the operation was ineffective. These figures presumably reflect the results of the tumour-host conflict when an autonomous tumour has been created, partly at least as the result of the previous treatment to which it has been subjected.

Preliminary Assessment of "Medical Adrenalectomy"

Despite the encouraging results achieved in this series and similar reports from other sources, the disadvantages attendant upon an ineffective adrenalectomy have led to attempts to duplicate its effect by non operative and potentially reversible means. The rationale of such an approach has been thoroughly reviewed in a companion article[5] and will not be discussed here apart from stressing the fact that cortisone inhibition of pituitary stimulation of adrenal œstrogens can, as in the case of surgical adrenalectomy, be successful only if the resultant increase in gonadotrophic stimulation of ovarian œstrogen is prevented by ablation of any functioning ovarian tissue.

During the third phase of the currently reported study, while awaiting the final outcome in the surviving patients, a preliminary appraisal of the effectiveness of cortisone therapy in similar situations was made. The results are recorded in Table VII and as might be anticipated when considering the nature of the more definitive and positive surgical procedure, they are less dramatic than those achieved by surgical adrenal-

TABLE VII.—Average Remission and Survival Periods With Cortisone Therapy
(Preliminary report of initial 29 cases)

Clinical response	*No. of patients*	*Percentage*	*cf adrenalectomy*	*Average remission*	*cf adrenalectomy*	*Average survival*	*cf adrenalectomy*
No subjective or objective remission	8	28	35 (includes postoperative mortality)	0	0	< 2 mos.	2.6 mos. (includes postoperative mortality)
Questionable subjective remission but no objective change	5	17		—		3 mos. 5 mos.	
Subjective remission but no objective change	3	10	15	1 2/3 mos.	2.75 mos.	3 1/3 mos.	8.7 mos.
Both subjective and objective remission	13	45	50	7 mos. (3 still in remission)*	14.0 mos.	9½ mos. (7 still alive)†	19.5 mos.
Totals	29	100	100	*Best result—24 mos. remission †Best result—30 mos. survival			

ectomy where average remissions and average survival times are approximately twice as lengthy as in "medical adrenalectomy". The percentage of patients affected favourably, however, is approximately the same, indicating the basic similarity of the procedures and the similar relative success to be anticipated if the same clinical situations pertain.

Lemon[14] has recently reviewed in scholarly fashion the place of cortisone and prednisone in the treatment of advanced mammary cancer. The effectiveness of these hormones may admittedly be predicated not only on their ability to produce adrenocortical suppression but also on a direct antineoplastic growth effect due to alterations of the internal cellular environment as suggested by the evidence to be quoted here.

In the first place, there is unquestionably a high incidence of ovarian stromal hyperplasia in patients with breast cancer, and even in postmenopausal women harbouring the disease the amount of œstrogenic substances in the urine may approximate the quantities recorded in normal women without breast cancer and still in the years of active sexual life. Corticoids have been demonstrated to be antagonistic on the tissue cell level to the effects of œstrogen and may be considered as œstrogen antagonists.[15] Progesterone and androgenic steroids are also physiologically antagonistic to œstrogen but these substances rapidly disappear after the menopause, and the corticoids remain as the only effective antagonists to the action of œstrogen on mammary tissue.

Following this line of thought Lemon[14] also reports a decrease in corticoid metabolites in untreated active metastatic breast cancer, and a decreased ratio of corticoid to œstrogen secretion may well represent the type of environment necessary to the continuing activity of mammary neoplasms.

Allen, Hayward, and Merivale[16] similarly report a higher ratio of 11desoxy 17-ketosteroid metabolites to 11oxy ketosteroids in treatment success after œstrogen deprivation than in treatment failures, suggesting that benefit occurred in those with active sex hormone production and consequently an increase in the œstrogen to corticoid ratio. This ratio could presumably be reversed by treatment. Hence one of the basic reasons for the success of corticoid therapy may be simply represented by the reversal of this trend and the creation of an environment not so favourable to the tumour. Accurate biochemical estimations of this kind may subsequently provide more certain information on which to base an intelligent prognosis as to the possible effectiveness of cortisone therapy, and therefore a more definite indication for its use than exists in the highly theoretical atmosphere of hormone therapy at the present time. The single fact that a favourable response has been reported when cortisone has been used in the treatment of remissions following major extirpative therapy, also indicates the potentiality of this additional effect.[17]

The further observation that cortisone may be peculiarly effective in the treatment of hypercalcæmia and in the palliative management of metastatic hepatic disease with relief of obstructive symptoms

as a result of the direct anti-inflammatory action of glucocorticoids, should not be ignored.[18] The euphoria occasionally produced although not indicative of a favourable objective response, is nonetheless a welcome occurrence in the unfortunate, anxious and depressed patient facing the challenge presented by the end-stage of this disease.

Discussion

These results stimulate thoughtful comparison of the effect of the two methods of controlling adrenocortical œstrogen production. In retrospect it would appear that the determining factor in considering surgical adrenalectomy is the evidence that 50% of the patients, despite attempts at clinical differentiation of favourable cases, do *not* demonstrate remission in their disease, in which case the burden of Addisonian deficiency is added to the heavy load already imposed on patients by their disseminated disease. Since this change is irreversible the risk of such an eventuality may well be prohibitive.

This is particularly true since the survival period is limited (average 19.5 months) and the period of actual remission averages only 14 months even in the most favourable regressions. Since there are no curative implications here, the dividends from this therapy may not be worth the gamble inherent at present in the operation. This conservative position is fortified by the observation that cortisone inhibition of adrenal œstrogens affects favourably the same group of patients as responded to surgical adrenalectomy, albeit less dramatically. Most would feel, we are sure, that the difference in remission and survival periods averaging at best less than seven months and 10 months respectively, is scarcely adequate reason for substituting an irreversible procedure with a 50% failure rate, for one which is reversible if unsuccessful.

Nonetheless, the dramatic response recorded when effective, makes it mandatory that continuing attempts be made to predict the response to adrenalectomy more accurately. If the high urinary œstrogen excretions measured chemically did actually prove to permit utilization of adrenalectomy with a chance of success varying between 66% and 75% as suggested by Block *et al.*[3] then, of course, this emphasis would be reversed and adrenalectomy would become a very attractive concept.

In utilizing adrenalectomy in a sequential programme of therapy the procedure should be deliberately reserved for a last ditch stand in the treatment of the usual "good cancer" but one must admit that it becomes a matter of delicate clinical judgment to decide the exact point at which is should be used because of its ineffectiveness when vital organs, such as the liver and the central nervous system are seriously affected. Consequently, it becomes a tool to consider as soon as the established methods of treatment have been proven to be ineffective, and these methods should not be continued, unless they are producing valuable objective responses, simply for the sake of doing something for the patient.

Established methods of treatment whether surgical, radiotherapeutic or hormonal in type are considered to be already ineffective when the lesion under treatment presents as an "acute" carcinoma. In such instances of "bad cancer" the major extirpations are perhaps most clearly indicated since an all-out attack on the disease is now necessary if any worthwhile results are to accrue from treatment. The principle of sequential therapy is not to be considered in these specific instances.

A comparison of surgical adrenalectomy and hypophysectomy would be invidious in the type of presentation here recorded. The problem has been reviewed previously.[5] Much of the comment concerning adrenalectomy outlined above is directly applicable to any consideration of hypophysectomy in this disease.

Summary

A series of 80 cases having surgical adrenalectomy as part of a programme of total œstrogen deprivation has been studied to the final fatal outcome in each patient. The stage of the disease at which major extirpative therapy becomes indicated is discussed. This falls largely within the scope of sequential therapy in most breast cancers. Only in the so-called

"acute" carcinoma is a bold attack, including adrenalectomy indicated as a possible initial therapeutic gesture.

The situational syndromes in which major extirpations may be considered are reviewed. Clinical and laboratory findings are evaluated in this regard.

The results achieved by total œstrogen deprivation are summarized in tabular form. Approximately 50% of patients accepting surgical adrenalectomy in the end-stage of their disease will demonstrate an objective remission averaging 14 months in duration, and a postoperative survival averaging 19.5 months.

A preliminary assessment of "medical adrenalectomy" is studied in comparison to the results of adrenalectomy.

It is felt that the irreversible nature of a major surgical extirpation and the fact that 50% will *not* demonstrate a remission, gives cortisone inhibition of the adrenal a preferable emphasis.

Adrenalectomy should only be considered in the most favourable instances with the same indications previously reported[1] still representing the best basis for clinical assessment of the problem. A prolonged history, previous response to castration and lack of any evidence of involvement of vital organs are fundamental requisites. Since successful adrenalectomy still represents the most effective tool yet available in the management of metastatic mammary disease, continued emphasis on means of predicting such a response is mandatory. If available, the indications for the operation might well be extended.

ACKNOWLEDGMENT

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RÉSUMÉ

Il est encourageant de noter combien les indications cliniques déjà établies[1] ont soutenu l'épreuve du temps. Physiologiquement parlant, il

est admis que la fonction ovarienne doit être contrôlée lorsque la surrénalectomie est pratiquée, afin de prévenir toute stimulation trophique subséquente d'œstrone ovarienne.

On admet, en général, que la castration soit indiquée jusqu'à 60 ans au moins. Une castration antérieure suivie de rémission objective, constitue une indication que la privation poursuivie d'œstrone par surrénalectomie devra amener une autre étape palliative.

Cette présente étude, qui vise surtout à montrer des résultats, nous intéresse donc du point de vue rémission et survie, ce qui est exposé aux graphiques 4 et 5.

Il est intéressant de noter que près de 40% des patients ont survécu plus d'un an, malgré leur état pré-opératoire désespéré. Les rémissions subjectives comprennent le soulagement de la douleur, l'amélioration dramatique de l'état de santé du maladé, le contrôle de la dyspnée, etc., alors que les signes objectifs d'amélioration comprennent le changement de volume des masses palpables ou des métastases pulmonaires radiologiquement décelables, la guérison radiologique des lésions ostéolytiques ou la résorption des épanchements.

Alors que cette étude se poursuivait, une appréciation préliminaire de l'éfficacité d'un traitement avec la cortisone dans des situations identiques était entreprise et, des résultats exposés au graphique 7, il ressort que la "surrénalectomie médicale" semble être de 50% inférieure à l'opération.

L'observation menée plus loin, cependant, qui montre que la cortisone soit étrangement effective pour traiter l'hypercalcémie et amener une palliation du côté des métastases hépatiques, avec amoindrissement des symptômes d'obstruction, ne devrait guère être ignorée. De même, l'euphorie produite occasionnellement, ne peut être que bienvenue pour ces malades anxieux et déprimés.

Il ressort donc qu'à cause de l'irréversibilité de l'acte chirurgical, et de l'absence de rémission dans 50% des cas, l'inhibition surrénalienne par la cortisone soit préférable.

La surrénalectomie ne devrait être considérée que pour les cas dont l'évolution est de longue durée, qui ont déjà répondu favorablement à la castration et qui ne présentent aucune évidence de métastase aux organes intéressés.

FUNDAMENTAL TECHNIQUES OF PLASTIC SURGERY AND THEIR SURGICAL APPLICATIONS. Ian A. McGregor, M.B., F.R.C.S. (Eng.), F.R.F.P.S.(Glas.), Consultant Plastic Surgeon, Glasgow Royal Infirmary. Foreword by C. F. W. Illingworth, C.B.E., M.D., Regius Professor of Surgery, University of Glasgow. 244 pp. Illust. E. & S. Livingstone Ltd., Edinburgh and London. The Macmillan Company of Canada Limited, Toronto, 1960. $5.00.

This is a small, well written, well illustrated book that seems aimed at being a liaison piece between the general surgeon and the plastic surgeon. This it does, and both will find common ground. The fundamental principles and rationale of wound care, local tissue shifts, flaps and pedicles are there for the general surgeon. They will also help students in plastic surgery and even the senior plastic surgeon can use the book to polish up his thinking and refurbish his teaching diagrams of procedures he has long taken for granted.

It is not an all inclusive textbook on plastic surgery and contains nothing on the treatment of face fractures, cleft lip and palate, rhinoplasty and otoplasty and other things which are fundamental parts of plastic surgery.

The first part describes the basic techniques of plastic surgery in detail. Wound care, incision placement, stitchcraft, the Z-plasty, varieties of free skin grafts, flaps, pedicles and tubes are described in logical, well illustrated sequence. The woefully sketchy second part considers the applications of these principles to general surgery and other specialties.

This is a good basic textbook and may well take its place with the fundamental texts of other specialties. The format and printing are pleasant, the illustrations are clear and well chosen and the price is most acceptable.

SURGICAL TREATMENT OF BONE AND JOINT TUBERCULOSIS. Robert Roaf, Department of Orthopædic Surgery, Liverpool, W. H. Kirkaldy-Willis, Orthopædic Centre, Nairobi, Kenya., and A. J. M. Cathro, Orthopædic Centre, Nairobi. 137 pp. Illust. E. & S. Livingstone Ltd., Edinburgh and London., The Macmillan Company of Canada Limited, Toronto, 1959. $5.00.

This volume represents the present day approach to the management of bone and joint tuberculosis. With the availability of p-aminosalicylic acid (PAS), isoniazid and streptomycin, the surgeon has become courageous in his direct attack on this disease. The authors emphasize this point using chemotherapy as a protective cover. The techniques of debridement or combined debridement and fusion, are discussed with enthusiasm and confidence.

The book is well organized, dealing with each area separately. Chapters on the spine and Pott's paraplegia are particularly well done and touch on the anterior approach to the vertebral column, indicating the authors' satisfaction with this approach. The size of the book does not allow for the details of operative technique in these problems.

Chapter after chapter reveals the direct surgical attack on the tuberculous lesion to be the most satisfactory in all but the earliest cases. The illustrations are clear and adequate in amount.

The authors are to be congratulated on this work. It is well written, concise and clear and is to be recommended to the orthopædic surgeon who desires a dynamic description of the surgical treatment of bone and joint tuberculosis.

SIGNIFICANCE OF CLOSTRIDIUM WELCHII INFECTIONS AND THEIR RELATIONSHIP TO GAS GANGRENE*

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OFTEN THE REPORT on a wound swab "*Cl. welchii* present" starts a sort of witch hunt in a hospital. The patient is strictly isolated, the operating room is scrubbed time and again and perhaps left vacant for 24 to 48 hours, and crackling messages go from medical superintendent to floor nurses, to senior surgeon, to infection control officer, to bacteriologist and to operating room supervisors, but not necessarily in that order. Can this attitude be justified? The question will be considered in this paper which reviews all cases of *Clostridium welchii* infection in a large hospital over a five year period, from 1955 to 1959, and speculates on their relationship to gas gangrene.

Bacteriologists often see this organism in routine smears from wounds, and tend to deprecate its significance in this hospital, not reporting it unless present in appreciable numbers, or if it appears significant from the case history. *Clostridium welchii* (Syn./- *Cl. perfringens*, and in older literature, *Bacillus aerogenes capsulatus* or *B. welchii*) is readily recognized and identified. In smears it is recognized morphologically as a rather large, thick, Gram-positive rod. In anaerobic culture, its colonies can be identified fairly easily. *However, bacteriologically, it is impossible to differentiate an organism causing true gas gangrene from a simple contaminant.* To quote MacLennan,[1] "Anaerobic infections are not bacteriological but clinical entities; this has been frequently emphasized but not widely appreciated. The same pathogenic anaerobe can cause widely different conditions; thus *Cl. welchii* may equally well be found in a healthy wound, and in a man dying from gas gangrene."

It is known that organisms other than *Cl. welchii* may produce gas gangrene, but in a large series of such infections, 80% were caused by *Cl. welchii*, 10% by *Cl. septique*, and 3% by *Cl. œdematiens*.[2] For practical purposes, it may be accepted that nearly all cases of gas gangrene in civilian hospitals are caused by *Cl. welchii*.

Clostridium welchii is widespread in nature, being present in soil, dust, sewage, milk, water, woollen clothing, the fur of domestic animals, and in the *normal* gastro-intestinal tract of man and animals. Since the organism is so common, it is a wonder that gas gangrene is relatively rare, although as many as 10% of serious wounds were said to be complicated by gas gangrene in the early part of World War I. In World War II the incidence was decidedly lower: in a large series of 187,936 major open wounds, gas gangrene occurred in only 1.76%.[2] The bacterial flora of open wounds is often similar in those that develop gas gangrene and in those that do not. Although dead material in wounds, especially dead muscle, and interference with the blood supply, favours the onset of gas gangrene, the problem still exists that of 100 similar wounds perhaps two will develop this dread infection. One can only infer from this that some strains of *Cl. welchii* are more virulent than others; but *which strains are most virulent* is still an unanswered question. A city may have no cases of gas gangrene for several years, and then three or four in a one or two month period.

Clinically, it has been recognized that *Cl. welchii* in a wound may:—(1) remain as a simple contaminant, (2) cause an anaerobic cellulitis, or (3) cause true gas gangrene (Clostridial myositis).

Over the years, clinicians have become aware of another clinical entity, fairly common in civilian practice following major surgery, that of *Cl. welchii* wound infection, or colloquially "Welch abscess". This is perhaps an end result of anaerobic cellulitis, and one may be splitting hairs by mentioning it, but the fact remains that in my experience "cellulitis" is rare, while abscess is relatively common. A further clinical observation is that the presence of *Cl. welchii* in a wound may delay healing; that is, a wound with a mixed infection of

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TABLE I.—Recorded Cases of *Cl. welchii* in Wounds
University of Alberta Hospital, 1955 - 1959

Simple contamination	40
Cl. welchii wound infection (Welch abscess)	16
Delayed healing (*Staph.* accompanying)	5
True gas gangrene	2
Total	63

Cl. welchii and *Staphylococcus aureus* may take longer to heal than one infected by *Staphylococcus aureus* alone.

In the University of Alberta Hospital over the five year period 1955-59, the presence in wounds of *Cl. welchii*, which is reported only if it occurs in apparently significant numbers or circumstances, was recorded in 63 cases. Its actual clinical significance is shown in Table I.

Most of these *Cl. welchii* infections followed abdominal operations. A detailed list of all *Cl. welchii* infections which followed various operations and traumatic wounds is shown in Table II.

TABLE II.—Detailed List of *Cl. welchii* in Wounds
University of Alberta Hospital, 1955 - 1959

Following ruptured appendicitis or acute suppurative appendicitis	
Number of infected wounds contaminated with *Cl. welchii*	6
Cl. welchii abscess	1
Following cholecystectomy or other operations on biliary tract	
Number of infected wounds contaminated with *Cl. welchii*	6
Cl. welchii abscess	2
Following gastrectomy	
Number of infected wounds contaminated with *Cl. welchii*	5
Cl. welchii abscess	2
Following operations on the ileum, colon or rectum (including Miles' resection)	
Number of infected wounds contamined with *Cl. welchii*	7
Cl. welchii abscess	1
Following herniotomy or orchidectomy	
Number of infected wounds contaminated with *Cl. welchii*	1
Cl. welchii abscess	2
Following suprapubic prostatectomy	
Number of infected wounds contaminated with *Cl. welchii*	2
Following burns	
Number contaminated with *Cl. welchii*	4
Following amputation for peripheral arterial disease	
Number of infected wounds contaminated with *Cl. welchii*	3
Cl. welchii abscess	1
Following traumatic injuries	
Number of infected wounds contaminated with *Cl. welchii*	6
Number of wounds in which *Cl. welchii* delayed healing	5
Cl. welchii abscess	5
True gas gangrene	2
Following miscellaneous conditions (hip pinning, pyelonephritis)	
Cl. welchii abscess	2

It is noteworthy that in all the infected wounds following gastrectomy the operation was carried out for *carcinoma*. There is probably more dead tissue in carcinoma, suitable for the growth of anaerobic organisms, than there is in peptic ulcer. This is in keeping with the well known fact that wound infection is much commoner following gastrectomy for carcinoma than for peptic ulcer.

In nearly all of the above infections, there were mixtures of organisms present including *staphylococci, E. coli, Aerobacter aerogenes, proteus, pseudomonas, paracolon, bacteroides* and *streptococci* or in other words intestinal organisms and pyogenic cocci, as well as *Cl. welchii*. However, in the cases of *Cl. welchii* abscess, this anaerobe was the predominating organism, and was thought clinically to be mainly responsible for the condition. As noted, it is most common following abdominal operations. One reason for this may be that though the antibiotics (such as neomycin) and sulfa drugs, commonly used to "sterilize" the bowel, have a wide antibacterial activity, they are only partially effective against *Cl. welchii*, a normal inhabitant of the bowel,[3] and certainly ineffective against *Cl. welchii* spores.

Clostridium Welchii Wound Infection (Welch Abscess)

The author has become increasingly familiar with this entity, if such it may be called, over the past five years. Sixteen cases were encountered, most of which developed following abdominal operations.

Clinically, the patient may have more fever than would be expected in the early postoperative period, and the pulse rate may be increased to 100 per minute. Signs of wound infection may be lacking in the first few days, but generally by the fourth or fifth day the incision shows a distinct bulge, with increasing redness and heat. The patient complains of pain in the wound. If a stitch is removed and the skin margins separated over the most bulging portion, much *foul-smelling, brownish*

watery pus exudes under considerable pressure, with perhaps a bubble of gas. With large amounts of this material and gas, one naturally suspects a bowel fistula. However, once the abscess is opened, temperature and pulse fall promptly to normal, the patient improves, and wound healing proceeds normally, though slowly.

In the 16 cases encountered, the abscess was usually confined to the subcutaneous fat. Cultures from the foul discharge yielded in a few cases *Cl. welchii* only, but in most, *Cl. welchii* plus mixed intestinal organisms. Penicillin was the commonest antibiotic used parenterally, and antitoxin was rarely administered, *but none of these patients developed true gas gangrene.* The cases occurred at wide intervals and in none was there any good evidence of cross infection.

Case Reports

Case 1.—Mr. P.S., aged 55 years had a subtotal gastrectomy in February 1958 for a large fungating carcinoma. His early course was uneventful. On the fifth day, however, his temperature was 101° F., pulse 100 per minute and he complained of pain in the wound. On inspection, the incision line was bulging, and when a stitch was removed, about 25 c.c. of foul smelling, watery, brownish pus escaped with a bubble of gas. This yielded a pure culture of *Cl. welchii.* Following drainage of the subcutaneous abscess, his temperature and pulse fell to normal the next day. The wound drained for about 10 days but was completely healed three weeks after the operation. This patient was given both penicillin and Chloromycetin®.

Case 2.—Mrs. I.K., aged 67 years, suffered a subcapital fracture of the right hip and a prosthesis was inserted on December 6, 1956. On the first postoperative day her temperature was 101° F., on the second postoperative day it was 102° F.

Four days postoperatively she showed a swinging temperature but otherwise she did not look particularly ill. Fluid and gas were palpated deep to the incision. Under general anæsthesia, a large foul-smelling abscess deep to the fascia lata was found. The muscle itself was alive and looked healthy. Direct smear showed Gram-positive bacilli and culture produced a pure growth of *Cl. welchii.* Penicillin was given. After drainage of the abscess her temperature subsided but she continued to run a low fever up to 100° F. for two weeks. The wound stopped draining after about two weeks.

Case 3.—Mr. P.D., aged 65 years had severe peripheral vascular disease, with early gangrene of a foot. Supracondylar amputation was performed on May 14, 1958, at which time the femoral artery was found to be occluded by thrombus but the muscle and skin bled.

On May 15 his temperature was 101° F. and there was some pain at the amputation site.

On May 16 his temperature was 102° F., pulse rate 120 and pain had increased. The dressing was taken down and the wound inspected. There was perhaps more swelling than normal but little drainage. A swab was taken however, for direct smear and culture. On May 17 his temperature was still elevated. A bacteriological report described Gram-positive bacilli on direct smear, morphologically resembling *Cl. welchii.* On May 18 his temperature was 102° F., pulse rate 120 and some crepitation was felt under flaps. This was confirmed by radiographs which showed gas located at the amputation stump site but not tracking along muscle planes (Figs. 1 and 2). It was thought that he had a *Cl. welchii* abscess localized to the stump. Cultures confirmed the presence of *Cl. welchii.* On May 19, the sutures were removed from the skin and fascia and the wound was left open. A moderate amount of foul-smelling, brownish, liquid material was present in the wound, but the underlying muscle appeared viable and retracted when cut. Repeat cultures on May 19 and May 21 also showed *Cl. welchii.* In 48 hours the patient's temperature and pulse returned to normal, and the wound infection at the stump gradually resolved by June 4, three weeks after his amputation. Since then, revisions of his amputation have been necessary in October 1958 and March 1959.

Delayed Healing Associated with Clostridium Welchii

Over the past five years, five instances have been encountered of delayed healing of traumatic injuries contaminated or "infected" with *Cl. welchii* and other organisms, usually *staphylococcus aureus.* Clinically these cases did not show *Cl. welchii* infection nor gas gangrene, and the diagnosis was made by finding the organism in considerable numbers on direct smear and in culture.

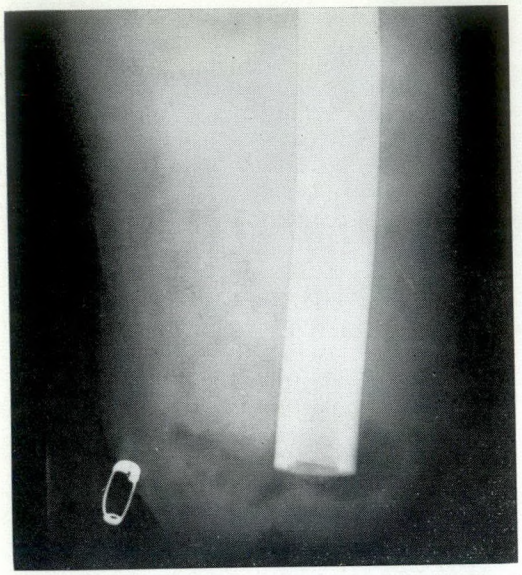

Fig. 1.—*Clostridium welchii* abscess localized to A.K. amputation stump four days postoperatively. Note the localized area of gas on radiograph.

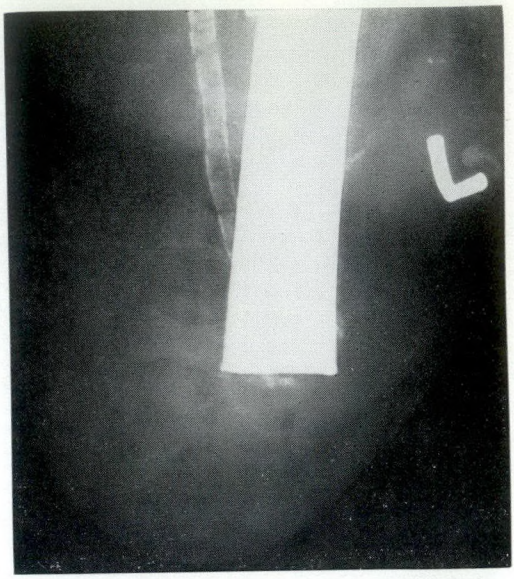

Fig. 2.—Normal A.K. amputation stump four days postoperatively, for comparison. No gas is seen on radiograph.

Case 4.—Mr. W.T., aged 33 years, suffered a crushing injury to a thumb on September 24, 1957, with a fracture of the distal phalanx and some loss of skin. On October 1, a culture yielded *Staph. aureus* and *Cl. welchii*. By October 4, however, the wound looked clean enough for a partial debridement and secondary closure which was carried out. On October 6, the patient was acutely ill with a temperature of 103° F., and pulse rate 110, so the wound was opened and drained. He ran a fever of 101° F. to 102° F. for one week. Further operations for removal of sequestra and for debridement were required on October 27 and 29, and November 5.

He was finally discharged on November 11, seven weeks after his original injury. This case suggests the possibility that a wound cannot be closed with impunity if *Cl. welchii* is present.

Gas Gangrene

There is no infection from which man suffers, more terrifying than this. It is fearsome to patient and to doctor alike. Fortunately it is rare in civilian life. In this hospital we have had but five cases in the past 10 years, and only two in the past five years. Of the five cases, three followed traumatic injuries; two of these patients lived and one died. The fourth case followed infection and ulceration of thrombosed hæmorrhoids, and the last arose in the donor area, the ilium, for a bone graft of spine. Both of these patients died. The cases were all sporadic in nature, were not related in any way, and therefore no cross infection could be alleged.

External trauma, intrauterine trauma and strangulated hernia have accounted for most reported cases of gas gangrene.[4]

Clinically the disease pursues a rapid and fulminating course. Commonly appearing about the fourth, fifth or sixth day after injury, it may appear as early as seven hours or as late as six weeks. MacLennan[1] states that 65% of his cases developed gas gangrene within three days following war wounds. Death often supervenes a day or two after the diagnosis is made. Trauma that produces a bursting or shattering effect to tissues is particularly favourable to the infection, and the calf, thigh and buttock are common locations.

The earliest symptom is pain at the site of the injury. This may be so much out of proportion to the early findings that the patient may be accused of malingering. On inspection, the wound may show only a little increased œdema with perhaps a tiny watery discharge. But within a few hours œdema progresses rapidly, and the

watery discharge becomes brownish. The skin surrounding the wound may show blebs filled with bloody fluid. If cultures are taken at this time, they must be obtained deep to any crusts or necrotic tissue. Immediate smear may show large Gram-positive rods, and anaerobic culture must be requested. Often there is very little or no gas, though usually a bubble of gas may be expressed from the wound. Serial radiographs, once or twice daily, may be helpful in demonstrating the presence of gas. Surgeons with experience claim they can "smell out" the process by the peculiar sweetish odour which is said to be characteristic.

Constitutional symptoms are those of a profound toxæmia. The temperature is often raised only slightly, but the pulse rate is usually rapid, and the blood pressure may fall, indicating severe shock. The patient may be pale and sweating, but still alert and bright eyed. Neither patient nor doctor may recognize the seriousness of the condition until the patient is *in extremis*, and death usually supervenes rapidly, despite treatment.

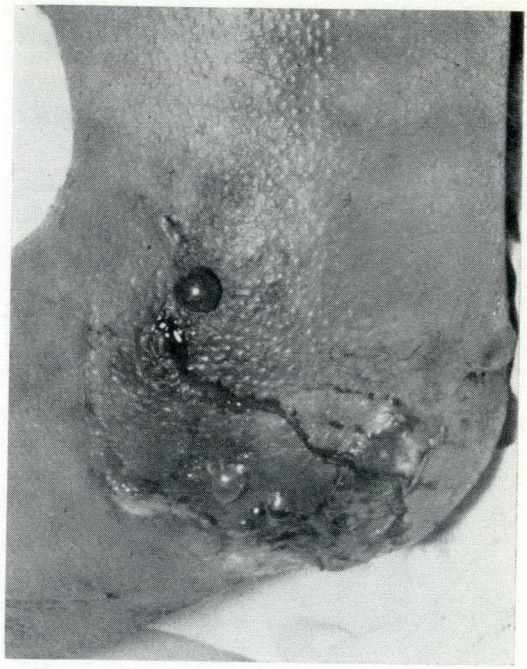

Fig. 3.—Gas gangrene left elbow region. Note the dirty wound with some suture material still present, the blebs filled with dark material, and the gross œdema of the skin.

The following case history is characteristic.

CASE 5.—Mr. A.L., aged 35 years, was involved in a car accident on May 4, 1957, and suffered a laceration of the left elbow penetrating into the olecranon bursa. The wound was debrided, sutured primarily, and he was given penicillin and antitetanus serum.

On May 6, there was some swelling of the elbow and he was given Chloromycetin® and Cathomycin®. On May 11 the whole arm was grossly swollen and the stitches were removed. The following day the patient was admitted to the University of Alberta Hospital, gravely ill with a temperature of 99° F., pulse rate of 100. He was frightened and toxic. The whole left arm was huge, from fingertips to shoulder girdle, at least twice normal size, and subcutaneous œdema had stretched the skin so that it resembled a plaster cast encircling the arm, threatening to cut off the circulation (Fig. 3). Through the œdema at the wrist, a good radial pulse could be felt. Over the olecranon, a thin brownish discharge exuded from beneath black necrotic skin. Anaerobic infection was considered likely. The process had extended to involve the whole left side of the thorax with œdema, so amputation was considered out of the question. Treatment was started with penicillin 500,000 units every three hours.

On May 14, 36 hours after admission, the whole arm was opened widely from shoulder to wrist, down to muscle level. The muscle did not appear necrotic. The olecranon bursa was opened widely. Cultures that day were reported as showing *Cl. welchii*. Despite blood transfusion, antitoxin and penicillin, the patient died rather suddenly on May 15, eleven days following his original injury. Autopsy revealed *Cl. welchi* present in muscle, extensive œdema of the whole left thorax as well as left arm, and bilateral pleural effusions.

The next case history is that of a man who survived.

CASE 6.—Mr. G.K., aged 24 years was run over by a truck on June 5, 1956. There was a crushing injury to the right thigh but no fracture. The femoral vein was torn but the artery was intact. A large skin flap, from knee to groin was sutured. The patient was admitted to hospital on June 7. Gas was found in the right thigh and could be traced subcutaneously to the right axilla. The whole right leg was discoloured. His temperature was 104° F., and pulse rate 130 per minute. Operation was carried out on June 8. The

sutures were removed revealing an evil-smelling purulent exudate. The adductor thigh muscles, which were necrotic, were excised. The right flank was incised and all wounds were packed widely open. Penicillin, 1,000,000 units, was given intramuscularly every three hours, and Terramycin® 500 mg. was given intravenously every eight hours. Direct smear of the pus showed large Gram-positive bacilli, which on culture proved to be *Cl. welchii*. On June 16, hæmorrhage from a branch of the right femoral artery was controlled by ligature. On June 24, a low thigh amputation was carried out, but on June 25 there was a hæmorrhage from the femoral artery, and to control it the external iliac artery was tied. The patient gradually improved, had a revision of his amputation stump on August 2, and was discharged finally from hospital, well, on October 4.

Case 7.—Mrs. L.P., aged 54 years, had a hysterectomy in 1956.* She was well until May 31, 1958, when she developed colicky abdominal pain, obstipation and vomiting which after a day or two became fæculent. On June 6 she was admitted to the Royal Alexandra Hospital, Edmonton, in fairly good condition considering that she had had almost complete intestinal obstruction for a week. The abdomen was moderately distended but showed no guarding and no rebound tenderness. Tinkling, high-pitched intestinal sounds were heard. Her temperature and pulse were normal and white blood count was 7000 per c.mm. A flat plate of the abdomen showed dilated loops of small bowel. Following supportive intravenous therapy and nasogastric suction for 12 hours, laparotomy was performed on June 7. Small bowel obstruction was found, caused by a small loop of ileum herniating through the broad ligament. This loop (4 cm. to 5 cm. in length) was fairly easily reduced, and was purplish in colour. Its normal colour returned rapidly and peristaltic waves passed through it, though it was noted that one of the mesenteric veins was thrombosed. It was thought wise not to do a resection and the abdomen was closed.

The patient was well for 18 hours following operation, after which time she became restless and hypotensive, with peripheral cyanosis. She was given neosynephrine, 1500 c.c. blood and Chloromycetin®, in the belief that her shock was most likely due to coliform septicæmia. Some gas developed in the laparotomy incision, and a little discharge appeared from which direct smear showed Gram-positive bacilli, which later proved on culture to be *Cl. welchii*. Her temperature was 100° F. and her pulse rate was 120 per minute. She died in a shock-like state on June 8, 25 hours after operation.

Autopsy showed peritonitis, and gas was demonstrated in the abdominal wall, liver and spleen. Cultures confirmed the presence of *Cl. welchii* in these sites as well as in the blood stream.

Looking back on this case, one wonders if the longstanding intestinal obstruction of a week's duration allowed virulent *Clostridia* to develop in the strangulated loop, which, when released (and following improvement of the blood supply), infected the peritoneal cavity and blood stream. Perhaps if the loop had been resected, this sequence might not have occurred. It was interesting that, at autopsy, the loop was still viable.

Treatment of Gas Gangrene

The prognosis is poor whatever treatment is used, and the mortality rate 50% to 75%. By far the most important prophylactic treatment is adequate wound debridement. Prophylactically, gas gangrene antitoxin is probably of little or no value, but penicillin may be.

Once the infection supervenes, measures must be heroic. Early amputation, if the process is confined to an extremity, or if not, wide drainage and excision of all dead muscle, are of the utmost importance. These wounds may be packed open with dressings saturated with zinc peroxide ointment, and crystalline penicillin G should be given in massive doses, 1,000,000 units intravenously and 1,000,000 units intramuscularly every three hours. Sensitivity tests in our laboratory, and also in reports from Korea,[5] suggest that the tetracyclines are the antibiotics of choice, so they should be given in full doses along with penicillin. They are probably best given intravenously, especially if the patient is in shock.

Theoretically, and also experimentally, gas gangrene antitoxin is useful in treating an established case.[6] Polyvalent (*welchii, septicum, novyi*) antitoxin is given both intravenously and intramuscularly in doses of 25,000 units every four hours.

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*I am indebted to Dr. H. Richard, Royal Alexandra Hospital, Edmonton, for this case report which shows how gas gangrene may very rarely (fortunately) result from strangulation of the bowel.

For a patient in shock, as most of these cases are, intravenous hydrocortisone, in the form of Solu-Cortef®, 100 mg. every six to eight hours may be of some use, to alleviate depleted adrenocortical function.

General supportive measures should be pursued actively. These include *multiple* and sometimes *massive* blood transfusions, sedation for pain, and care of fluid and electrolyte balance, watching especially for acidosis.

Discussion

From the review of all *Cl. welchii* infections in a large hospital over the past five years, certain conclusions may be drawn. Simple wound contamination is relatively frequent and was noted in 40 cases, even though it was reported by the laboratory only when it was considered likely to be of significance. Trivial contamination is undoubtedly much more frequent. In five cases, the presence of *Clostridia* probably delayed wound healing. Rather surprisingly, an entity of *Cl. welchii* wound infection (or Welch abscess) is not rare, since 16 cases were encountered. In these patients, there is no grave problem, for simple drainage cures the infection in most instances quite speedily. There is no need for undue concern, clinical or administrative, about this type of case, for it appears to have no relationship to gas gangrene.

In this series not a single instance of cross infection has been found. These cases are no more infectious than a coliform infection, for example, and decidedly less so than staphylococcal (especially due to so-called hospital strains) or hæmolytic streptococcal infections.

True gas gangrene in hospital practice appears to be a sporadic, rare, but catastrophic event. Only two cases were seen in a five year period. We doubt if this incidence can be lowered by strict isolation of all cases of *Cl. welchii* contamination and infection, and indeed our experience denies this, for none of these cases went on to develop gas gangrene, and none "spread" gas gangrene to a new patient. Since some of the cases of "Welch abscess" were nursed with isolation technique, this conclusion might not be altogether valid. However, in both of the patients who developed gas gangrene, there was inadequate wound debridement and the wounds were closed primarily. Both in reality were admitted with gas gangrene.

The only really effective prophylactic measure against the development of gas gangrene is thorough cleansing and debridement of "dirty" wounds, leaving them open. This has been proven conclusively in both World Wars, and in Korea, but is sometimes forgotten in civilian life. It is realized that many wounds are better closed primarily, such as those in the face, and over tendons.

Why an occasional wound, adequately treated, will develop gas gangrene, and 50 similar ones will not, is still an unanswered problem. It must have something to do with the virulence of *Cl. welchii*, and the resistance of the patient.

Summary

An attempt has been made to classify and investigate all cases of *Cl. welchii* infection recorded in a hospital over the past five years. Simple contamination is relatively common, "Welch abscess" not uncommon, and true gas gangrene decidedly rare. As far as we can ascertain, contamination and wound infection rarely if ever, lead to gas gangrene. We feel that none of these infections are very "infectious" as far as other hospital patients are concerned, because we have not noted cross infection, when no special precautions were taken.

The finding of *Cl. welchii* in a wound has no particular significance and demands no greater administration or nursing attention than that accorded to any septic wound. "Witch hunts" are off! Gas gangrene is a clinical and not a bacteriological entity.

The treatment of *Cl. welchii* abscess, or wound infection, is simple drainage; the treatment of gas gangrene is heroic, with radical surgery, antibiotics, gas gangrene antitoxin, blood transfusions and other supportive measures. Since the mortality rate or gas gangrene remains so high, prophylaxis is all important, and consists of adequate cleansing and excision (debridement) of wounds.

Acknowledgment

Dr. R. D. Stuart, Professor of Bacteriology, University of Alberta, has accompanied the writer

on "infection rounds" of the surgical and pædiatric services of the University of Alberta Hospital, once weekly over the past five years. The hospital is grateful for his keen interest in clinical bacteriology, and I am deeply indebted to him for his stimulating criticism of this article.

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Résumé

Une tentative pour classifier et investiguer tous les cas d'infection par *Cl. Welchii* survenus à l'Hôpital de l'Université d'Alberta durant les derniers cinq ans, a été entreprise. La simple contamination est assez fréquente, l'abcès à *Cl. Welchii*, non inusité, tandis que la gangrène gazeuse est décidément rare. En autant qu'on puisse le certifier, la contamination et l'infection des plaies conduisent rarement, à la gangrène gazeuse. Nous avons l'impression qu'aucune de ces infections n'est contagieuse, en ce qui concerne les autres malades hospitalisés, n'ayant jamais relevé d'infections transmises, alors qu'aucune précaution spéciale n'était encouragée.

L'identification de *Cl. Welchii* dans une plaie n'a pas de signification particulière, ni demande de plus grande précaution d'administration ou de "nursing" que celle accordée à toute plaie infectée. La gangrène est une entité clinique plutôt que bactériologique.

L'abcès *Cl. welchii*, se traite par simple drainage; la gangrène gazeuse se traite héroïquement par une chirurgie radicale, par l'administration d'antibiotes et d'antitoxine et par des transfusions sanguines associées aux autres médications de support.

Puisque le taux de mortalité dans la gangrène gazeuse reste élevé, la prophylaxie est des plus importante, et consiste en un nettoyage adéquat et en un débridement de plaies.

THE GENERAL PRACTITIONER

ROGER GILES, SURGIN PARISH CLARK AND SCHULEMASTER, GROSER AND HUNDERTAKER*

Respectfully informs ladys and gentlemans that he drors teef without waiting a minute, applies laches every hour, blisters on the lowest tarms, and vissicks for a penny a peace. He sells Godfathers kordales, kuts corns, bunyons, docters hosses, clips donkies wance a month, and undertakes to took after everybody's navls by the ear. Joesharps, penny wissels, brass kanelsticks, frying pans, and other moosical hinstruments hat greatly reduced figers. Young ladies and gentlemen larnes their grammur, and langeudge in the purtiest manner, also grate care taken off their morrels and spelling. Also zarm singing, taychings base vile and other sorts of fancy work, squadrils, pokers, weazels, and all country dances tort at home and abroad, at perfeksun. Perfumery and snuf in all it branches. As times is cruel bad I beg to tell ee that i has just beginned to sell all sorts of stashonery, ware, cox, hens, vouls, pigs and all other kinds of poultry, blackin-brishes, herrins, coles, scrubbing-brishes, traykel and godly bukes and bibles, mise-traps, brick-dist, whisler-seeds, morrell pokkerankechers, and all sorts of swatemaits, including taters, sasages, and other garden stuff, bakky, zizars, lamp oyle, tay kittles and other intoxzikating likkers, a dale of fruit, hats, zongs, hair oyle, pattins, bukkets, grandin stones and other aitables, korne and bunyon zalve, and all hardware. I has laid in a large assortment of tripe, dogs mate, lolipops, ginger beer, matches, and other pikkles, such as hepson salts, hoysters, Winser sope, anzetrar—Old rags bort and sold here and nowhere else, new laid eggs by me Roger Giles; zinging burdes keeped, such as howles, donkeys, paykox, lobsters, crickets, also a stock of celebrated brayder.

P.S.—I tayches geography, ritmitmetic, cowsticks, jimnastics and other cheynees tricks.

*Exact words of an old Cornish signboard.

URINARY DIVERSION TO THE ISOLATED ILEAL SEGMENT*

A. D. MacKENZIE, M.D., F.R.C.S.[C] and
G. J. ANKENMAN, M.D., F.R.C.S.[C],† *Vancouver, B.C.*

Ureterointestinal anastomosis has been carried out by various techniques since the latter 19th century, in an attempt to perfect a satisfactory substitute for the urinary bladder. Clarke and Leadbetter have surveyed the results of 2897 ureterosigmoidostomies alone.[1] This procedure carries a high incidence of reflux with hyperchloræmic acidosis in a third of cases irrespective of technique, and ascending pyelonephritis in over 30%. Although these hazards are reduced using a combined tunnel principle and end to side anastomosis, it is now generally felt that the urinary and fæcal stream should usually be separated to achieve long term satisfactory results. Two methods are in common usage at the present time; the rectal bladder (dry colostomy with ureterosigmoidostomy), and urinary diversion to an isolated segment of ileum.

The rectal bladder provides a low pressure and usually sterile reservoir for urine. Differential electrolyte absorption may occur, but is not often a clinical problem in absence of renal damage. Reflux does occur, but under a considerably lower pressure than when bowel continuity is intact.[2] A competent rectal sphincter is essential for continence. The majority apparently do have some difficulty with enuresis.[3]

The use of an isolated segment of ileum is an attractive alternative for urinary diversion. Fifty years ago Shoemaker successfully treated a patient with a solitary kidney and tuberculous bladder by diverting the ureter to an ileal loop brought to the skin surface. Later the ileum was rediverted into the bladder. Since 1950 Bricker has been a leading proponent of this method of urinary diversion on this continent and has reported on a large series of such cases at various times.[4] Excellent contributions on the advantages and disadvantages of the use of ileum in urological surgery have been made by Pyrah.[5, 6] The essential advantage of ileum is that active peristalsis tends to keep the segment empty[7] when brought to the skin surface so that it acts as a conduit rather than a reservoir reducing stasis and subsequent ascending infection and electrolyte reabsorption. The main disadvantage is the necessity of wearing a permanent urinary drainage appliance.

The first ureteroileal conduit operation was performed in Vancouver in 1951 on a young man who was incontinent of urine from congenital disease. At the present time he is gainfully employed. Blood chemistry is within normal limits, and the upper urinary tract is normal on intravenous pyelography. It is our purpose in this paper to review the indications for the procedure carried out in 52 cases at Shaughnessy Military Hospital and the Vancouver General Hospital since 1951, and to discuss the technique and results in 35 cases in which first-hand knowledge and complete follow-up is available.

The indications for this procedure are listed in Table I. There are many possible indications. The procedure is particularly applicable to congenital lesions associated with an incompetent anal sphincter where the necessity for urinary diversion exists.[8]

Good illustrated papers describing the technical aspects of the procedure are available in the literature.[4-6] With experience, some useful modifications have been made.

The gastrointestinal tract is mechanically prepared in the usual manner. Although bowel sterilization was carried out in earlier cases, it is no longer considered necessary or advisable.

Technique

The abdominal incision is planned in accordance with the exposure needed, leaving the right abdomen unscarred for application of appliance. A lengthy left lower paramedian incision will provide

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*Presented by Dr. G. J. Ankenman at the Annual Meeting of the Royal College of Physicians and Surgeons of Canada, Montreal, January 1960.
†University of British Columbia and the Vancouver General Hospital.

TABLE I.—Indications for Ureteroileal Conduit Operation

	No. of patients
I. *Congenital*	
1. Exstrophy of bladder	2
2. Recto-vesical fistula	2
3. Myelo-meningocele	1
II. *Inflammatory*	
1. Contracted bladder and hydronephrosis of tuberculous origin	2
2. Intractable urethral stricture	1
III. *Neoplastic*	
1. Carcinoma of urinary bladder	
(a) palliative diversion	8
(b) preparatory to cystectomy: completed	7
contemplated	2
(c) coincidental with cystectomy	9
2. Carcinoma of urinary bladder and prostate	1
3. Carcinoma of cervix.	
(a) fistula (post-radiation)	6
(b) intractable radiation cystitis and recurrent pyelonephritis	1
(c) coincidental to pelvic evisceration	1
4. Carcinoma of rectum invading G.U. tract.	4
5. Carcinoma of female urethra	1
IV. *Neurogenic bladder*	4
Total	52
Included in the above series:	
1. Conversion of ureterosigmoidostomies	
(a) recurrent pyelonephritis	1
(b) recurrent pyelonephritis and hyperchloræmic acidosis	2
(c) progressive hydronephrosis	1
2. Conversion of nephrostomy solitary kidney (local pain)	1
3. Conversion of ileocystostomy (Cordonnier procedure)—surgical failure	1

good exposure. An appendectomy is carried out at a suitable stage to avoid future diagnostic and technical problems associated with appendicitis. The ureters are isolated early below the pelvic brim and temporarily ligated to distend them with urine. When a cystectomy is performed it is probably desirable to remove the bladder first to avoid traction on anastomotic sites.

A segment of ileum, 12 cm. to 20 cm. in length is selected 30 cm. to 45 cm. proximal to the ileocæcal valve. The loop should not

TABLE II.—Sex and Age Distribution—Both Sexes, (Men 36—Women 16)

Age	*No. of paitents*
0 - 10	4
20 - 30	2
30 - 40	4
40 - 50	6
50 - 60	12
60 - 70	17
70+	7
Total	52

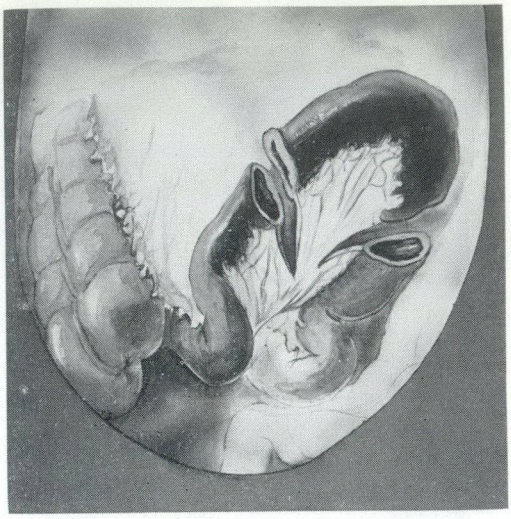

Fig. 1.—Isolation of the ileal segment.

be made longer than necessary to pass through the abdominal wall with a broad mesenteric base (5 cm. to 7 cm.) which is not incised deeply (4 cm. to 5 cm.) shown in Fig. 1. Transillumination will aid in choosing a segment with a good arterial arcade. Bowel continuity is reestablished anterior to the loop by end to end anastomosis (Fig. 2). The mesenteric rent is closed with fine silk sutures with care not to close the apex too tightly and compromise the blood supply to the isolated segment. The loop is irrigated and the proximal end closed (Fig. 3).

The ureters which are now distended with urine are mobilized with care to pre-

Fig. 2.—End to end anastomosis anterior to the isolated segment.

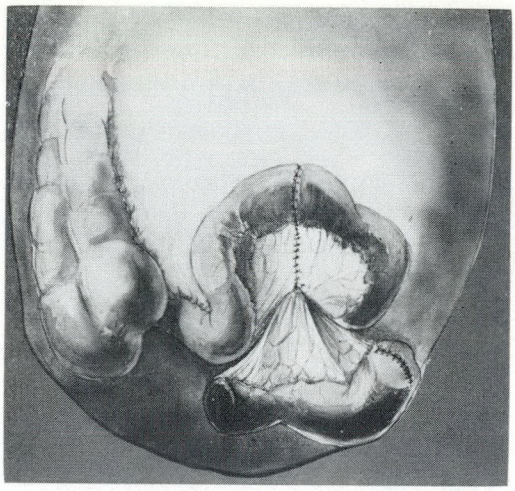

Fig. 3.—Closure of proximal end of segment.

serve the adventitia. The left ureter is brought through the sigmoid mesentery without angulation (Fig. 4). The ureteral ends are "fish-mouthed" and anastomosis is carried out end to side on the antimesenteric border adjacent to the proximal end of the loop. Anchor sutures are placed at each corner and mucosa to mucosa anastomosis is completed using continuous 0000 chromic catgut (Nesbit technique).

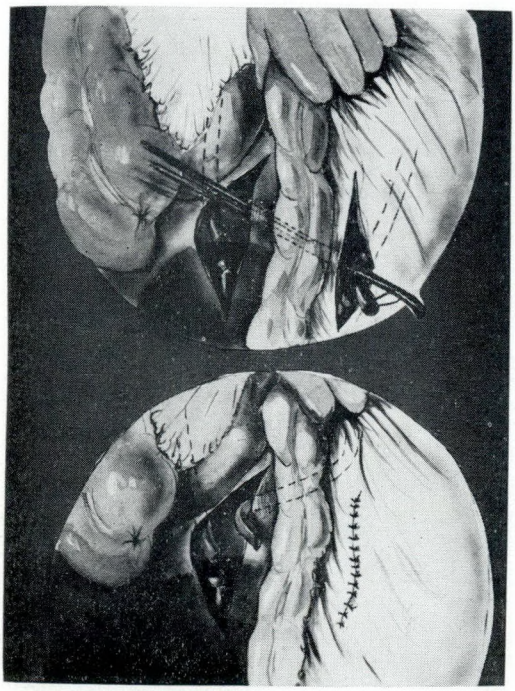

Fig. 4.—Left ureter brought through sigmoid mesentery without angulation.

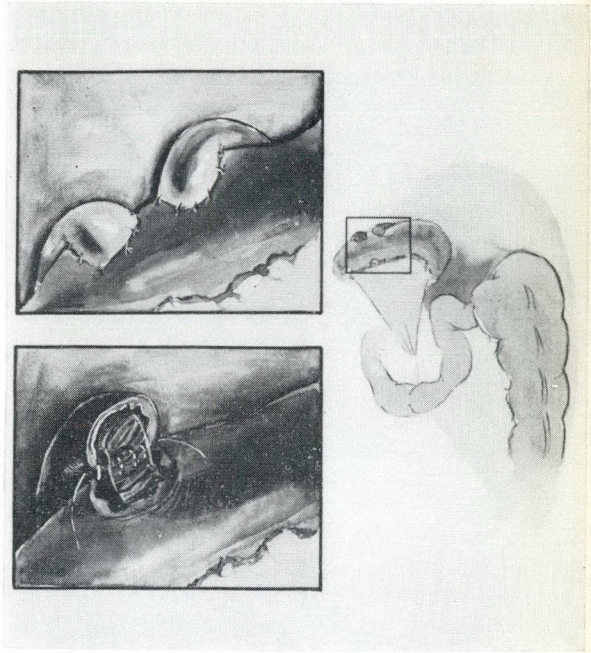

Fig. 5.—Ureteroidal anastomosis.

A minimal number of interrupted sutures may be used for reinforcement if necessary (Fig. 5). The anastomosis is facilitated if done over a red rubber catheter which is withdrawn at completion.

A suitable ileostomy site is selected between the right anterior superior iliac spine and umbilicus. There must be adequate room for the disc of the permanent urine receptacle. Leakage can be a problem if the disc overlies an operation scar or a low costal margin. A circular piece of skin 1 inch in diameter is excised along with the underlying subcutaneous tissue and external oblique fascia. An adequate aperture is made through the remaining abdominal wall and peritoneum and the distal end of the ileal segment is brought to the skin surface. An ileal bud about 1 cm. in elevation is created using four silk everting sutures incorporating the (a) bowel mucosa (b) seromuscular coat 2.0 cm. proximal (c) margin of skin aperture. The spaces between these major sutures are closed by approximating mucosa and skin (Fig. 6). Finally, the ileal loop and ureters are tacked to the peritoneum to close all apertures. A drain brought out through a stab wound is essential as urinary drainage is not uncommon for a few days. No. 30

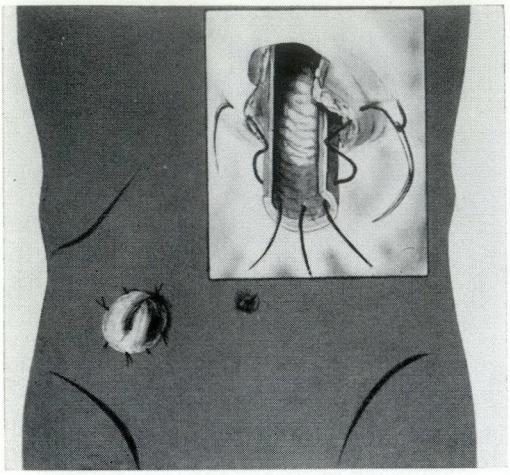

Fig. 6.—Formation of ileostomy bud.

wire is used for fascia in abdominal closure. The skin about the ileal bud is prepared with tincture of benzoin compound in the operating room, and a Thomas Fazio Limited drainage apparatus is applied snugly about the bud. This permits inspection of the bud, is atraumatic and serves quite satisfactorily until the permanent appliance is fitted in two to three weeks' time. Catheterization of the loop has not been necessary.

Postoperative Care

Continuous gastric suction is necessary for a longer period than usual after abdominal surgery. It is ordinarily four or five days before active peristalsis is present. This may, in part, be due to ileal anastomosis and partly due to urinary leakage. Electrolyte replacement and antibiotic administration are necessary.

Ileostomy bags should be changed as soon as they begin to leak, in order to protect the skin. In the first half of the series, ileostomy dilatations were carried out using the finger, but recently this has not been done and retraction stricture has not been a problem. Before discharge from hospital the patient is fitted for a permanent urine receptacle* as designed by Nicolai.[9] A set of discs with various sized apertures and concavities is available for individual fitting and the appliance ordered accordingly. This apparatus can be worn up to 10 days without change.

Adequate follow-up should include periodic electrolyte studies and intravenous urography. There is always early hydronephrosis ostensibly related to anastomotic œdema, and little is to be gained by radiography until six weeks postoperatively, unless there is a clinical indication.

*Supplied by Eastern Sales Co., 1559 New Britain Avenue, West Hartford 10, Connecticut.

Postoperative Results

Complications, present status and classification of results are tabulated in Tables III, IV and V. In 50% of cases no complications were recorded.

TABLE III.—Complications in 35 Patients on Whom Ureteroileal Conduit Operation was Performed

General	
I. *Early*	
Coronary insufficiency	1
Thrombophlebitis	1
Atelectasis	1
Pneumonia (*staph. aureus*)	1
Unexplained jaundice	1
II. *Late*	
Homologous serum jaundice	1
Specific	
I. *Early*	
Intraperitoneal	
Prolonged paralytic ileus	2
Mechanical obstruction requiring surgical relief	2
Urinary fistula	3
Fæcal fistula (leading to peritonitis and death)	1
Wound	
Infection (all minor)	7
Dehiscence	1
Acute pyelonephritis	1
II. *Late*	
Electrolyte disturbances	6
Ileal bud	
Redundancy	1
Retraction and stricture	1
Ulceration	1
Difficulty fitting appliance	2
Hydronephrosis	5
Urinary calculi	
Renal and loop calculus	1
Ureteral	1
Wound	
Ventral hernia	1

TABLE IV.—Present Status

Surgical deaths	1
Dead of primary disease	8
Dead of uræmia	1
Alive and well (no known disease)	20
Alive (known disease)	5
Total	35

TABLE V.—Classification of Results

Good	28
Poor	4
Equivocal	3
Total	35

Morbidity and Mortality

There was one operative death in the series of 35 patients (mortality rate 2.8%) due to a technical error when, during closure a loop of bowel was caught by a suture with subsequent small bowel fistula. This occurred in an elderly man with poor resistance and he died of generalized peritonitis. This mortality rate is lower than that of most reported series. (Pyrah—25% mortality in 212 cases, Cordonnier[10]—9% mortality in 41 cases, Bricker[4]—over 10% mortality in 150 cases, but many of these deaths were attributable to pelvic evisceration and when figures are broken down it is considered that the mortality rate from ileal segment procedure should be about 3%).

General complications were not greater than might be expected with any major abdominal surgery. Two cases of mechanical small bowel obstruction required surgical relief. In one case obstruction was at Lane's band, the other was due to a twisted loop. Although some urinary drainage for a short time is not uncommon, in three instances it was prolonged for a few days with spontaneous resolution.

In this centre even a stitch abscess is classified as a wound infection. In no instance was infection serious or was hospitalization prolonged as a result. There was one instance of wound dehiscence although in other series this is not an uncommon complication (Pyrah 14%, Cordonnier 9%). Our low incidence may be related to almost routine use of wire for fascial closure.

Late electrolyte abnormalities were notable in six cases. Two of these patients (converted ureterosigmoidostomies) had renal damage preoperatively and required medication. In general, conversion of ureterosigmoidostomies to an ileal bladder improved the electrolyte disturbance. Two other patients who eventually died of their primary disease had disordered electrolytes. Two are alive and well with a mild asymptomatic hyperchloræmic acidosis and are not on medication.

A redundant ileostomy which was made too long initially was satisfactorily modified under local anæsthesia. A retracted and relatively strictured ileostomy in one patient does not require correction. Two patients have had difficulty with appliance fitting and subsequent leakage. In one instance this is due to the appliance disc overlying a low costal margin and in the other the appliance overlaps an old appendectomy scar.

Out of eight cases of well developed preoperative hydronephrosis there was complete regression by diversion of both ureters in three patients. In two of these there was no demonstrable function on intravenous pyelography preoperatively. For that reason we have no hesitation in anastomosing markedly dilated ureters unless a ureter is grossly so unhealthy that anastomosis is likely to fail. Such a ureter was tied off uneventfully on four occasions. In one patient a non progressive hydronephrosis has remained. In five cases postoperative hydronephrosis developed. Four of these patients died of their primary disease. The other patient developed a stricture at the anastomotic site and required an emergency nephrostomy. Re-anastomosis was later carried out with a satisfactory result.

The preoperative pyelogram shown in Fig. 7a is that of a patient who had a ureterosigmoidostomy five years previously because of radiation fistula. She had recurrent pyelonephritis for three years before conversion to ileal loop drainage. The upper tract showed good recovery within two months (Fig. 7b).

One patient with a solitary kidney has developed renal calculi, but renal reserve is so poor that surgery is not contemplated. A relatively large calculus demonstrated in his ileal loop by radiography was crushed under direct vision with a lithotrite. Another patient was admitted to hospital in shock secondary to septicæmia. The right ureter was found blocked by a calculus. Following ureterolithotomy he has done well.

It is not easy to categorize results, but from the point of view of patient's satisfaction and pyelography in 28 cases the

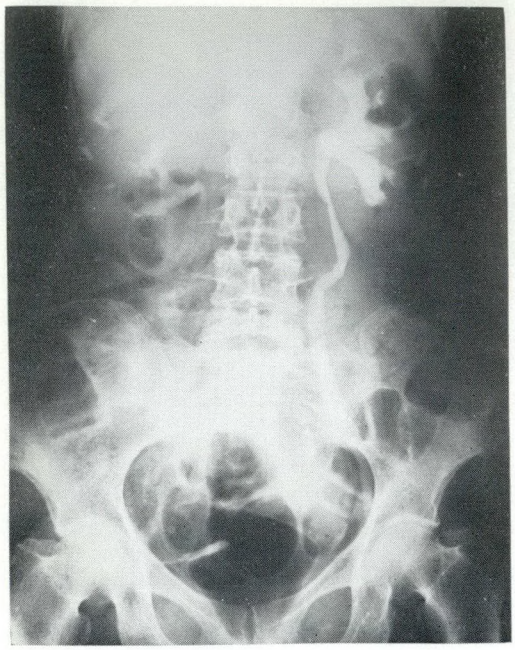

Fig. 7a.—Preoperative intravenous pyelogram.

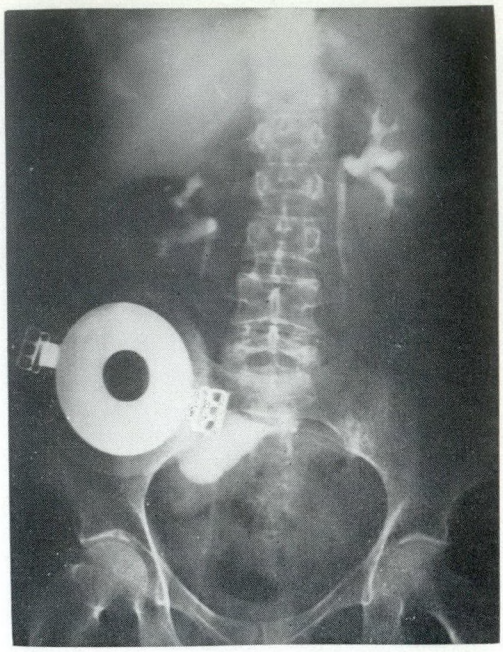

Fig. 7b.—Two months postoperative intravenous pyelogram.

results are good or at least satisfactory. In four cases in which results are categorized as poor, all died of their primary disease and although the diversion possibly prolonged life for a short time, their disease was too advanced to have made the procedure worthwhile.

Conclusions

A review of urinary diversion to the isolated ileal segment in 35 cases has been presented. There was one operative death due to a technical error. Overall morbidity approaches 50%, but with experience this has been reduced. The results indicate that this method of urinary diversion is a good one even for palliative purposes. It is a major surgical procedure requiring close attention to details for satisfactory results. It should not be contemplated on the debilitated patient with advanced disease and a short life expectancy. More time and experience are perhaps required to decide if it is a superior diversionary method to the rectal bladder. It appears to be the method of choice where an incompetent anal sphincter exists. In the presence of hydronephrosis it would seem more physiological to divert the urinary stream to a conduit rather than a reservoir behind a functioning sphincter. Finally, the ileal bladder allows the satisfaction of a normal bowel movement which can be one of the highlights of an older individual's existence.

Acknowledgment

The authors thank Mr. Victor Doray, Medical Illustration Department, Vancouver General Hospital, for his assistance in preparation of the illustrations.

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Résumé

Plusieurs techniques d'anastomose urétéro-intestinale ont été proposées, depuis la fin du 19ème siècle, dans le but d'obtenir un substitut satisfaisant pour la vessie. Les deux méthodes qui dominent actuellement sont la vessie rectale (colostomie avec urétéro-sigmoïdostomie) et la vessie iléale.

La vessie rectale procure un réservoir habituellement stérile et à basse pression qui ne crée pas de problème électrolytique si les reins sont sains. La continence est assurée par la compétence du sphincter anal.

L'utilisation d'un segment d'iléon isolé constitue une alternative attrayante de dérivation urinaire. Depuis 1950, Bricker s'est fait le propagandiste de cette méthode et a rapporté plusieurs séries de cas. L'avantage essentiel de cette méthode vient de ce que, du fait du péristaltisme actif, le segment d'iléon tend à se vider et qu'étant abouché à la peau, il devient un conduit plutôt qu'un réservoir, réduisant ainsi la stase et l'infection ascendante subséquente, de même que la réabsorption électrolytique. Le principal désavantage vient de la nécessité de porter un appareil en permanence.

L'expérience de 52 cas au "Shaughnessy Military Hospital" et au "Vancouver General Hospital", depuis 1951, associée aux résultats de 35 malades, dont l'évolution post-opératoire est connue, montre que cette méthode est adéquate, même dans un but palliatif. L'intervention est grave et requiert une attention particulière des détails pour l'obtention de résultats satisfaisants.

Elle ne doit pas être entreprise chez des malades gravement atteints et dont les jours sont comptés. Le temps et l'expérience montreront si la vessie iléale est meilleure que la vessie rectale. Elle semble indiquée dans les cas d'incompétence anale. En présence d'hydronéphrose, il semblerait plus physiologique de dériver le flot urinaire à travers un conduit, que dans un réservoir fermé. De plus, la vessie iléale, permet l'évacuation intestinale normale.

ATLAS OF ANATOMY AND SURGICAL APPROACHES IN ORTHOPÆDIC SURGERY—UPPER EXTREMITY. Vol. I. Rodolfo Cosentino, M.D., Preface by Arthur Steindler. 192 pp. Illust. Charles C Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1960. $11.50.

The author has prepared an atlas of the anatomy of the upper extremity that is of interest in orthopædic surgery. Using photographs of carefully dissected specimens, the various regions of the upper extremity are well visualized and labelled. Minor structures are not labelled, allowing for clarity of the figures. The immediate relationships of important structures are demonstrated in each dissection. Figure 29 is especially good, showing the ulnar nerve as it passes through the medial intermuscular septum.

The second part of each region deals with the surgical approaches to this area. This emphasizes the specific anatomy of the incision. However, the very nature of this volume allows for only a few incisions to be illustrated, leaving the "Atlas of Surgical Approaches" totally incomplete. This must not be allowed to detract from the value of the work. The utility of this book is its clarity of appreciation of structures that are important, and this constant clarity and appreciation is demonstrated throughout the entire volume.

The author is to be congratulated on his publication of a work requiring such meticulous attention to detail. Surgeons who wish to review the anatomy of a region, will find this volume easy to use and satisfying in content.

A DICTIONARY FOR MEDICAL SECRETARIES. Isabel Alice Stanton, Secretary, Director of Graduate Training, Baylor University College of Dentistry. 175 pp. Charles C Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1960. $7.25.

As the author states "If I were beginning again as a secretary, the very first thing I would do would be to learn the word roots". In the reviewer's opinion, doing this and, of course, everyday practice in the use of medical terminology are the fundamentals most relied on by the medical secretary.

The larger well known medical dictionaries, although quite suitable for the medical secretary as far as spelling and pronunciation are concerned, can hardly be termed simple. The definition of words in "A Dictionary for Medical Secretaries" will certainly present a much clearer picture than in the past, for the experienced medical secretary, as well as a fairly simple basic dictionary for the novice. However, it must be noted at this point that the Canadian secretary uses the English style of writing certain words and not the American style.

Irregular Words (which often present problems) and the List of Instruments given, are again examples of how successfully the author has managed, in so compact a dictionary, to cover the most important information required while structuring it in such a way as to take in the medical terminology that the medical secretary will be called upon to use most frequently.

RECENT ADVANCES IN HYPOTHERMIA*†

W. G. BIGELOW, F.R.C.S.[C] and R. O. HEIMBECKER, F.R.C.S.[C],‡ *Toronto, Ont.*

THE PURPOSE of this paper is to review some refinements in the technique of pure hypothermia and outline our current application of hypothermia combined with cardiac bypass. One clinical example of the use of pure hypothermia and one example of cardiac bypass combined with hypothermia will be discussed.

SIMPLE HYPOTHERMIA

Clinical hypothermia in the range of 28° C. to 31° C. has become a safe procedure provided four essential problems are medically managed. These will be discussed briefly.

1. *Control of Body Temperature*

Surface cooling is preferred to extracorporeal cooling because it is easier. In children a cold water bath, or ice bags are used. In large children and adults, cooling blankets are still our method of choice. This should be carried out in an air conditioned operating room (less than 22° C.) with six ice bags inside the blanket. It is simpler and just as efficient as immersion in cold water. Besides experience and a knowledge of drift in body temperature, we are guided by the rectal and œsophageal temperature. Fig. 1 illustrates the relationship between these two temperature readings during an open heart operation. The œsophageal thermocouple should lie opposite the heart. An indication that the drift in body temperature after active cooling is near an end is the reduction in the temperature difference between œsophageal and rectal reading which occurs.

Cooling machines are available with a separate warming reservoir which allows rapid switchover to rewarming.

2. *Cardiac Irritability*

The use of prostigmine with circulatory arrest has been important in reducing cardiac irritability. As the temperature falls below 30° C. however, there is increased cardiac irritability. This was originally blamed on the low blood pH but the study by Waddell[1] in our laboratory demonstrated a surprising relationship between the blood citrate level and the incidence of irreversible ventricular fibrillation during surgery. This is shown in Table I and from this table it may be seen that the use of citrated blood produced a high incidence of irreversible fibrillation. When this is compared with operations carried out with heparinized blood one notes the expected low citrate levels and that irreversible ventricular fibrillation has not been a problem. We now use fresh heparinized blood and at proper body temperature levels the heart does not show undue irritability. During closure of the thoracotomy wound protamine sulphate is given in dosage equal to the amount of heparin administered.

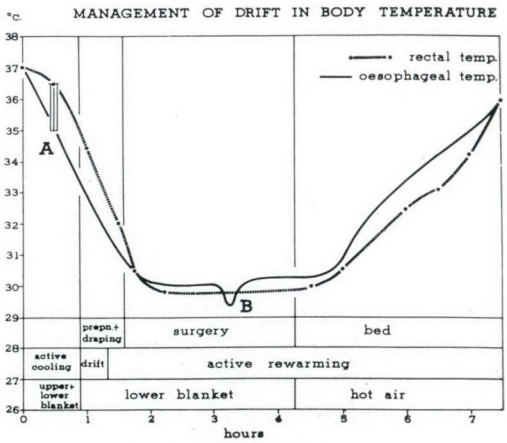

Fig. 1.—The drift in body temperature that occurs after active cooling is accompanied by a gradual reduction in the difference between rectal and œsophageal temperature. When these two are equal it usually indicates a stable body temperature.

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*Presented to the International Cardiovascular Society, Munich, Germany, September 1959.

†This work has been supported by grants from: The Ontario Heart Foundation, the Bickle Foundation and the Department of National Health.

‡Cardiovascular Division, Toronto General Hospital.

TABLE I.—Control of Cardiac Irritability Hypothermia—42 Cases

	Serum citrate over 20 mgm. %	*Death due to venticular fibrillation*
Citrated blood.....	40%	16%
Heparinized blood....	0%	0%

3. *Rewarming Shock*

The occasional appearance of shock and death during rewarming was a problem. In Waddell's study it was found that this was related to a metabolic acidosis which could not always be corrected by hyperventilation or respiratory alkalosis. This work showed that rewarming shock could be eliminated with better control of pH if one or two types of anæsthetic was used. These were (1) lytic cocktail or (2) the addition of ether during the period of cooling. Shivering was thus controlled. Table II illustrates these points. We prefer the ether technique and this has been described by Virtue.[2]

4. *Occasional Bleeding Tendency with Hypothermia*

Occasionally following hypothermia one encounters a patient, usually an adult, with a decidedly abnormal tendency to bleed. The one consistent abnormality of the blood which might explain this has been the development of thrombocytopenia during cooling.[3] Wensel[4] has studied this phenomenon and by administering 15 mg. to 20 mg. of heparin intravenously before human cooling we have reduced the thrombocytopenia during hypothermia, from 43% to 19%. Since using this technique in the last 30 open heart operations there has been no evidence of abnormal bleeding.

It is interesting that this bleeding tendency does not seem to be as great a problem in the hypothermia surgery of children. This may be explained by some essential difference in their platelets.

TABLE II.—Control of Rewarming Shock Hypothermia—29 Cases

Method of anæsthesia	*pH below 7.20*	*Rewarming shock*
Pentothal, nitrous oxide, curare.....	50%	40%
Lytic cocktail or ether...	21%	0%

Clinical Application

The Correction of Septum Secundum Atrial Septal Defects

Pure hypothermia still has a place in open heart surgery in view of recent improvements in diagnostic techniques. The claim that all congenital defects should be corrected with cardiac bypass so that the surgeon is "in a position to deal with unexpected pathology" is currently not tenable. Vector electrocardiography, better selective dye curves and angiocardiography have made it possible to diagnose uncomplicated atrial septal defects with great accuracy.

At the Toronto General Hospital, 50 adults with atrial septal defects of the secundum type have been operated upon using pure hypothermia. A survey of these patients, 15 years to 57 years of age, is shown in Table III. There has been only one death in the elective group of 42 cases, a mortality rate of 2.4%.

In a salvage group of eight cases with either total pulmonary resistance of 800 or over, or terminal cases in chronic, uncorrectable failure in hospital, there were four deaths. The average age in this group was 41 years, with three over 50 years of age.

Thus the correction of an uncomplicated atrial septal defect is safe and is indicated once the diagnosis has been made, provided there is at least a 2 to 1 pulmonary to systemic flow ratio.

Patients with atrial septal defects which we now prefer to repair with cardiac bypass are those with: (1) anomalous pulmonary venous drainage, particularly associated with the superior vena caval type defect; (2) associated mitral valve involvement; (3) where there is possibility of a primum or atrio-ventricular communis type of defect.

Twelve septum secundum defects have been operated upon with cardiac bypass.

TABLE III.—Atrial Septal Defect—Adults (Secundum) 50 Operations: Hypothermia

Cases	*Number*	*Deaths*	*Mortality percentage*
Elective.....	42	1	2.4
Terminal.....	8	4	50.0

Nine were found to have complicated defects at operation and there were no deaths.

All patients with atrial defects treated by both methods have been tested postoperatively with dye curves, or right heart catheterization. These results will be reported. As in other reported series,[5, 6] there has been an improvement in the mortality rate and there have been no deaths in this series in the last two years.

Combined Hypothermia and Cardiac Bypass

Clinical Application

Our clinical cardiac bypass surgery has been combined with hypothermia in 88 of the last 95 operations. A heat exchanger has been designed by Doctor Heimbecker,[13] a modification of the Duke University unit,[7] and it has been used on the arterial side of the circuit which includes a modified Cooley bubble oxygenator and a Pemco pump. A body temperature of 28° C. to 31° C. during cardiac bypass has increased the efficiency of flow rates. This technique is used on all types of cases unless a short bypass is expected. It has been accompanied by a lower incidence of pulmonary complications, more satisfactory blood pressure following bypass and a smoother postoperative course than previously observed. Swan[8] has reported that at a body temperature of 30° C. only about one-half the flow is required to maintain a constant arteriovenous oxygen difference. Anoxic arrest when required should be better tolerated.

The interior of the heat exchanger has many highly polished, thin walled, steel tubes. The temperature of the circulating water is simply controlled by a thermostat which in turn is connected to the hot and cold water tap. The complete unit is shown in Fig. 2. The cooling process takes about five minutes to attain body temperature of 29° C. to 31° C.[13] Thus it does not need to increase the complete bypass time. It is initiated during partial bypass and is completed while on total bypass. The inferior vena caval cannula may be partially occluded while on total bypass to ensure more general cooling. The desired temperature has usually been attained by the time the cardiac lesion has been examined by cardiotomy.

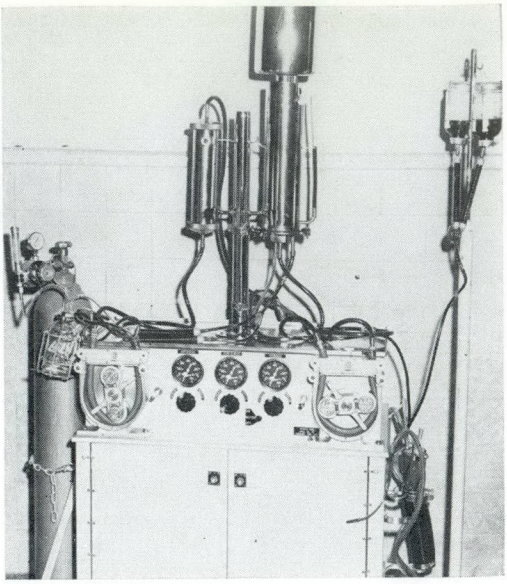

Fig. 2.—Combined hypothermia and cardiac bypass. A heat exchanger (left) is connected to modified Cooley oxygenator (right) and Pemco pumps mounted on wagon (lower portion of illustration).

More caution is necessary during rewarming and a maximum temperature in the heat exchanger of 40° C. produces slower rewarming. Since this takes a somewhat longer time, and to ensure that it does not significantly add to the complete bypass time, rewarming is instituted towards the end of the technical suturing process and when completion is assured.

The Surgical Correction of Mitral Regurgitation

Our small series of 16 cases of open heart annuloplasty for mitral regurgitation not only illustrates the application of this combined technique but the operation is of some current interest in itself. There are two essentials to the investigation of cases of mitral regurgitation. Left heart catheterization with two needle technique of reflux dye curve has been carried out in 50 cases in our cardiovascular unit[9] and has proven to be a very reliable guide to accurate diagnosis. A forward dye curve with oximeter in the ear is combined with a reflux curve from a cuvette recording of left atrial blood. Analysis of these curves

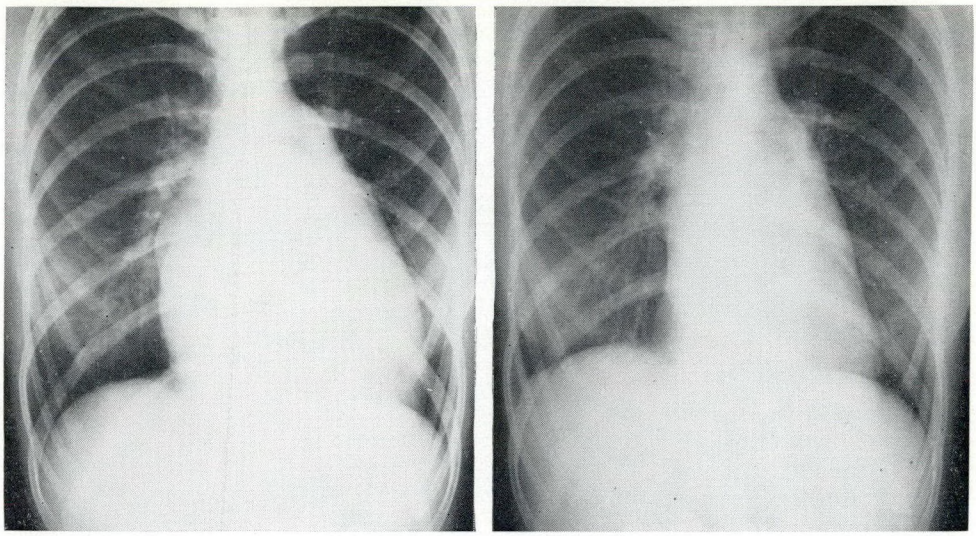

Fig. 3.—Reduction in heart size one year after operation to correct mitral regurgitation.

can predict with remarkable accuracy the amount of mitral regurgitation.

Ideally, this lesion is best corrected without elective arrest. If there is any significant degree of aortic insufficiency however, there is so much reflux blood that visualization and correction is impossible without arrest. One should be aware of this before operation. The reflux dye study of Braunwald and Morrow[10] is important in the preoperative assessment of aortic insufficiency. Aldridge[11] in our unit has modified this test and has performed it in over 30 cases. When aortic insufficiency is present we have used anoxic arrest to maintain a bloodless field.

A right postero-lateral incision is used and the left atrium is incised posterior to the lung root. The annuloplasty is carried out with Ivalon reinforced stitches. All these patients were in an advanced stage of their disease and most of them had pure insufficiency. Sixteen patients have been operated upon. There were three deaths and one late recurrence in the first five cases. In the last 11 cases there have been no deaths. All have been remarkably improved clinically and all have maintained their improvement. Fig. 3 shows a one year follow-up chest radiograph with marked reduction in heart size. Fig. 4 illustrates the reflux dye curve at left heart catheterization before and after surgery in another patient.

With proper selection of cases, annuloplasty for mitral regurgitation may prove a very worthwhile operation. Our very encouraging results were probably aided by the use of hypothermia during cardiac bypass.

The Future of Hypothermia

The use of cardiac bypass with deep (10° C. to 20° C.) hypothermia is still

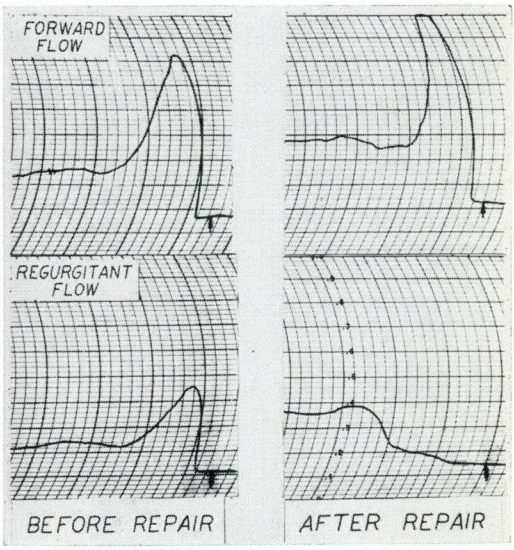

Fig. 4.—There is no evidence of regurgitation in the postoperative dye studies: Simultaneous sampling of dye injected in the left ventricule. Upper panel shows values of forward flow measured by the ear oximeter. Regurgitant flow cuvette in left atrium is seen in the lower panel.

experimental. The studies of Gollan[12] and others have been repeated by Heimbecker[13] who has successfully combined cardiac bypass with a body temperature of 15° C. in dogs, with cardiotomy and survival. All other experimental workers in this field have encountered a high mortality rate.

The reports of Drew[14] are interesting in this regard. He has had clinical success in the use of deep hypothermia with extracorporeal cooling without an oxygenator. There is good evidence that human tolerance to profound hypothermia is similar to that of animals and that the age of the patient is an important factor. Newborn dogs can be cooled to 5° C. with survival.[15] This tolerance to profound hypothermia disappears gradually with maturity and reaches a plateau in the adult. Drew's technique of deep hypothermia is both rational and timely as it is applied to children. One would expect definite limitations in tolerance to low body temperature with less success when applied to a number of adults.

Our research team is still investigating the phenomenon of hibernation[16] with the hope that this knowledge will increase the tolerance of the body to deep hypothermia and perhaps extend the range of safe body temperature to 8° C. or 10° C.

One and one-half hours of intracardiac surgery is currently safe with cardiac bypass, with or without moderate hypothermia. Our goal is to increase the safety of a two to three hour procedure and produce a simple physiological technique of surgery with a minimum of cannulæ and apparatus.

Summary

Refinements in the technique of hypothermia are discussed.

The surgical correction of atrial septal defects is reviewed as an example of the use of simple hypothermia.

The clinical use and experimental status of hypothermia combined with cardiac bypass is assessed. As an example of the clinical application of this combined technique, the open heart surgical treatment of mitral regurgitation is reported.

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Résumé

L'hypothermie clinique variant de 28° C. à 31° C. est devenue de toute sécurité, en autant que le contrôle de la température corporelle soit maintenu, que l'irritabilité cardiaque soit réduite au minimum, que le "shock" par réchauffement soit éliminé, et que la tendance occasionnelle à l'hémorragie, surtout chez les adultes, soit annihilée.

L'exclusion cardiaque associée à l'hypothermie profonde (10° C. à 20° C.) demeure encore au stage expérimental. Les expériences de Gollan ont été reprises par Heimbecker qui a combiné, avec succès, l'exclusion cardiaque avec une température de 15° C., chez le chien, pour exécuter des cardiotomies avec survie. Tous les autres expérimentateurs, ont affronté un taux de mortalité élevé.

Drew a rapporté des succès cliniques en se servant d'hypothermie par refroidissement extra-corporel, sans oxyginateur. La tolérance humaine à l'hypothermie profonde semble superposable à celle des chiens et l'âge devient un facteur important. Les chiens nouveau-nés peuvent être refroidis à 5° C. et survivre, mais cette tolérance s'atténue progressivement, avec la maturité, pour demeurer en plateau chez l'adulte. La technique de Drew est aussi rationnelle qu'à point, puisqu'appliquée aux enfants.

Notre équipe expérimentale étudie encore le phénomène d'hibernation, dans l'espoir d'augmenter la tolérance corporelle à l'hypothermie profonde.

La chirurgie intra-cardiaque qui dure une heure et demie est actuellement sans danger, avec ou sans exclusion cardiaque, avec ou sans hypothermie modérée. Notre but est d'accroître la sécurité des opérations qui durent deux à trois heures et de produire une technique simple qui n'exigera qu'un minimum de cannules et de montage.

TYPICAL GYNECOLOGIC OPERATIONS. Dr. Siegfried Tapfer, in charge of the University Clinic for Gynecology and Obstetrics, Innsbruck, Tirol, Austria. Translated by L. M. Szamek, M.D., New York. 81 pp. Illust. 2nd ed. J. P. Lippincott Company, Philadelphia and Montreal, 1960. $9.00.

This book does not set out to be a textbook, and it is not one. It shows the art of surgery as practised by many well known and respected continental surgeons.

The illustrations are very clear and show each step of the procedures with the text following the pictures very well.

Many of the procedures described are not done by British or American surgeons nowadays. The radical surgery described is not as radical as usually performed for carcinoma. In the text they explain that their results warrant this less extensive surgery, but few figures are quoted and none are up to date, so that this statement is hard to verify.

The book makes pleasant reading for those interested in the art of surgery, and also from a historical viewpoint.

THE TRIUMPH OF SURGERY. Jurgen Thorwald. Translated by R. and C. Winston. 454 pp. Illust. Pantheon Books Inc., New York; McClelland and Stewart Limited, Toronto, 1960. $7.00.

What has happened in surgery in the past century is a wonderful story and medical men know it. But doctors are scientists and they write the history of this era critically, with facts and dates and logic, with little expression of the fantastic daring, of the emotions involved and of the rivalries, personalities and feuds. *The Triumph of Surgery* tells of those surgical giants who first dared the operations that are now so common: thyroidectomy, cord tumour, cholecystectomy, herniorrhaphy, pneumothorax, corneal transplant, craniotomy, spinal anæsthesia.

Some may find the telling of these stories by an imaginary surgeon traveller apocryphal. Historical personalities are described and quoted as are the characters in a novel. There is evidence of a great deal of research into the personalities of the founders of modern surgery and the background of each "breakthrough". The stories are told well and the great occasions might have been as tense and emotional as this. These "firsts" are so historic that they should be written for all to read.

The Triumph of Surgery is especially suitable for the layman, the medical student and the doctor who does not make a hobby of the history of his profession.

MODERN TRENDS IN ACCIDENT SURGERY AND MEDICINE. Edited by Ruscoe Clarke, M.B.E., M.B., F.R.C.S.(Eng.), F. G. Badger, B.Sc., F.R.C.S. (E), and Simon Sevitt, M.D., M.Sc., F.R.C.P.I., D.P.H., of the Birmingham Accident Hospital, England. Butterworth & Company (Toronto) Limited, 1959. $15.00.

This is much more than another textbook on emergency surgery for it consists of a series of discussions on various aspects of trauma by members of the staff of the famous Birmingham Accident Hospital. The patient as a whole and the broad aspects of his situation as an accident victim and a surgical problem is the theme. Medical, physiological and pathological viewpoints are emphasized. The volume is kept reasonable in size by leaving out several large subjects: e.g. burns, anæsthesia and head injuries.

Surgeons who deal with trauma, orthopædic, plastic, or general surgery, will find this book stimulating. From the first chapter on the organization of accident services, through blood transfusion, uræmia, technique of wound surgery, fractures, embolism, hand, face and nerve injuries to rehabilitation, the writing is clear, thoughtful, and up to date.

The book is beautifully printed, illustrated and bound. Surgeons and students of surgery will find it a valuable addition to their libraries.

EXAMINATION OF THE BILIARY TRACT WITH CHOLOGRAFIN: A SURGICAL-RADIOLOGICAL CORRELATION*

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Toronto, Ont.

THIS REPORT is based on a detailed analysis of 597 examinations of the biliary tract with intravenous Cholografin, in 216 of which, a surgical-radiological correlation was possible. It includes the findings of our first series of 228 cases which were presented at the meeting of the Royal College of Physicians and Surgeons of Canada at Toronto in October 1956, and which were subsequently published.[1]

PHYSIOLOGY

In the presence of good liver function, 90% of the injected Cholografin is excreted by the liver, causing rapid opacification of the bile ducts if the medium is able to collect therein.[4] Cholografin is not concentrated by the gallbladder, but if the cystic duct is open, and if the medium is able to pool in the gallbladder, its density allows fairly rapid opacification of this organ but does not give information regarding gallbladder function.[2, 12] It is reported that Cholografin does not enter the enterohepatic circulation as does Telopaque and certain other oral preparations. If such be the case it should not cause reopacification of the biliary tract after it has reached the bowel, but there is some controversy regarding this statement.[10]

PREPARATION OF THE PATIENT

Our procedure regarding the important consideration of proper preparation of the patient has been as follows: A thorough cleansing of the bowel with castor oil and a total fast from all food and drink for 12 hours before the examination, was carried out. No drug was used to disperse troublesome gas when it was encountered.

SELECTIONS OF PATIENTS

Some of the patients had had a previous examination using an oral medium (Telopaque) but in others Cholografin was used in the initial examination. The patients were examined on both an in hospital and outpatient basis and were selected for such examination by their physicians. No particular age group was deliberately excluded but the series did not include any children or any cases following acute trauma.[7, 9]

ROUTINE OF EXAMINATION

The manufacturer's suggested routine of sensitivity testing, administration and radiography was modified somewhat. Preliminary conjunctival instillation was omitted, but the intradermal test was employed, as was an intravenous test dose of 1 c.c. of the medium. Following this 40 c.c. of 20% solution of the sodium salt, or later in the series 20 c.c. of the methylglucamine salt was injected routinely. Serial radiographs were made at five, 10, 15 and 30 minute intervals, with additional films at one, two and three hours, or at such other intervals as the radiologist considered to be indicated. The radiologist was in continuous and active supervision of the examination, making changes in exposures, technique and positioning as he considered necessary in order to obtain the maximum information. Planograms and fluoroscopic "spot films" of the biliary tract were not made. No drug, such as morphine, that would interfere with the normal physiology of the patient was used, except in the case of certain patients selected for reexamination.[5, 11]

Further modifications in this routine have been introduced after reviewing the films reported in the present series and will be discussed later. In the second series of 369 examinations, a sample of blood for serum bilirubin estimation was taken immediately before the examination.

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*Presented at the Annual Meeting of the Royal College of Physicians and Surgeons of Canada, Montreal, January 1960.

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General Findings

No severe reactions were encountered and "anti allergy" drugs were used only occasionally when minor reactions such as urticaria were encountered. These minor reactions were very few in number and included some nausea and vomiting which were satisfactorily minimized by slow injection of the medium. The injection was usually given over an interval of approximately 10 minutes.[6,8] In these examinations comparison was not made between the size of the bile ducts in those patients who had symptoms of biliary tract disease and those with no symptoms.[3]

The radiologists' impression of the size of the ducts proved to be accurate when compared with T tube or cystic duct operative cholangiograms, or with the operating surgeons' inspection.

There was considerable variation in the size of the common bile ducts in those patients from whom the gallbladder had been previously removed and likewise in those on whom no previous operation had been performed. It is probably not valid to use the size of the ducts alone as an indication of their obstruction or abnormality. It has been stated that in those cases in which the gallbladder has been removed or the cystic duct occluded (i.e. those with no overflow reservoir for the common bile duct), the normal sized ducts varied from 3 mm. to 8 mm. in greatest diameter; that those ducts of 8 mm. to 15 mm. diameter might or might not be involved by stricture or obstruction at the distal end, and that those greater than 15 mm. in diameter were likely to be obstructed to a varying degree.[5,6] We did not find any evidence contrary to this concept.

The quality of visualization of the biliary system throughout the series was considered to be very satisfactory, and with very few exceptions the radiologist was able to make a definite statement as to the presence or absence of calculi.

Detailed Findings

In this study the radiological interpretation of normality does not exclude the possible existence of cholecystitis.[2] Regarding the ducts, it refers to normality in their size and the absence of calculi. This report is divided into two sections. The first, section A, deals with 216 patients whose diagnosis was proven, including the 100 patients in the initial series. The second, section B, concerns the remaining 318 patients whose diagnosis was unproved. Each section will be discussed under the following headings:

Group 1. Cases in which the gallbladder had been previously removed.

Group 2. Cases in which the gallbladder was not visualized.

Group 3. Cases in which the gallbladder appeared normal.

Group 4. Cases in which the gallbladder contained calculi.

Section A. Surgical-Radiological Correlation. (216 Cases with Proven Diagnosis, Table I)

Group 1. 25 patients whose gallbladder had been removed (Fig. 1.)

No opaque medium was seen in the common bile ducts in five of these 25 patients, three of whom had common bile duct obstruction due to calculi with or without associated stricture, and two of whom had fistulae draining the common bile ducts apparently preventing pooling of the opaque medium in the ducts. In the remaining 20 the radiological findings were confirmed at operation. In this group of 25 there were 13 with stones in the common bile duct, three with common bile duct stricture and four with cystic duct stumps.

Group 2. 116 patients whose gallbladder was not visualized (Fig. 2).

In 30 of these cases no opaque medium was visualized in the ducts. Twenty-one of these had sufficient disease of the biliary tract or liver parenchyma to prevent excretion of the medium by the liver in sufficient concentration to opacify the ducts;[3] four showed opaque medium in the duodenum but none in the ducts, indicating lack of adequate contraction of the sphincter of Oddi,[4] and in the other five the same phenomenon must also be postulated since there was neither oper-

TABLE I.—Section A. 216 Proven Cases

GROUP 1. Gallbladder removed 25	(a) Common bile duct not seen		5
	(i) Common bile duct obstruction with stones with or without stricture	3	
	(ii) Common bile duct fistula	2	
	(b) Common bile duct with stones		13
	(c) Common bile duct with stricture (no stones)		3
	(d) Cystic duct stumps		4
GROUP 2. Gallbladder not seen 116	(a) Common bile duct not seen		30
	(i) Biliary tract or liver parenchyma disease	21	
	(ii) Opaque medium in duodenum only	4	9
	(iii) Cause unknown	5	
	(b) Opaque medium excreted by liver		9+86=95
GROUP 3. Gallbladder normal 14	(a) Gallbladder with calculi 3, Gallbladder normal 11		
	(b) Common bile duct with calculi		3
	(c) Common bile duct with stricture, no calculi		3
	(d) Common bile duct enlarged — œdema head of pancreas		1
	(d) Common bile duct enlarged — carcinoma head of pancreas		1
GROUP 4. Gallbladder with calculi 61	(a) Gallbladder with calculi		61
	(b) Common bile duct with calculi		12

ative, clinical nor laboratory evidence to explain lack of excretion by the liver.

In the 95 cases in which the liver apparently excreted opaque medium, non visualization of the gallbladder was due to either obstruction at or in the cystic duct or neck of the gallbladder by calculus, fibrosis, and/or œdema, or to a fistula from the gallbladder preventing pooling of the media within it.

There were two instances of radiological misinterpretation. In one case a calculus was missed in the radiographic investigation, and in another, the presence of a calculus was suspected but not confirmed at operation. In the remainder, the radiological findings were confirmed at operation.

Group 3. 14 patients whose gallbladder appeared normal (Fig. 3).

In three of these patients opacification of the gallbladder was poor, and calculi later proven to be present were not recognized on the radiographs. In addition, a calculus was reported in a dilated duct in one patient but its presence was not confirmed at operation. In the remainder, the

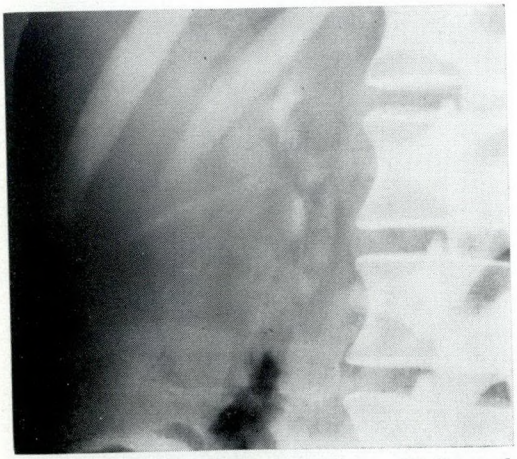

Fig. 1.—Post cholecystectomy. Radiograph shows stones in the common bile duct.

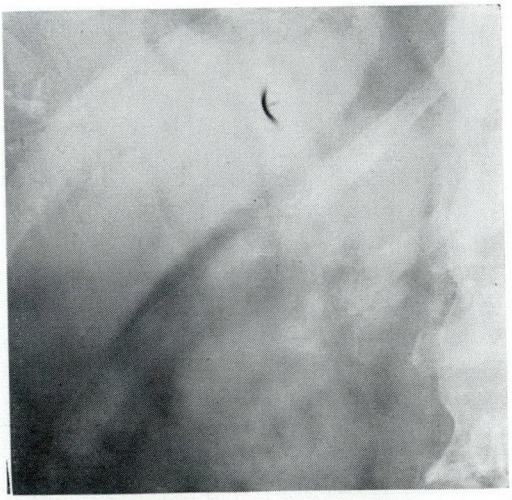

Fig. 2.—Gallbladder not visualized because of stone impacted in neck of gallbladder. Common bile duct enlarged due to hypertrophied sphincter (1 cm. in diameter). Air outlining biliary tract due to a fistula.

roentgenological findings in regard to both the gallbladder and the common bile ducts were confirmed.

Three of these 14 patients had calculi in their common bile ducts without calculi in the gallbladder; there was a stricture at the sphincter in three others, and the distal end of an enlarged duct was involved by œdema of the head of pancreas and by carcinoma of the head of pancreas respectively, in two others.

Group 4. 61 patients whose gallbladder contained calculi (Fig. 4).

Calculi were found in the gallbladder at operation in all of these cases. In two instances, although the roentgenograms indicated calculi in the common bile ducts, the surgeon did not find a calculus in one, and in the other, calculi were not detected by palpation, although the duct was not explored. The latter case has been coded as a radiological error. In two other instances, calculi were found at operation, but had not been noted in the roentgenograms. As there had been about a three month interval between radiographic examination and operation, it is possible that these calculi had passed into the ducts from the gallbladder during the interval. However these two cases have also been designated as radiological errors.

There were two cases of unusual interest in this group. The first was one in which the common bile duct was not visualized. At operation this duct was found to be enlarged and literally packed with small calculi and "biliary mud", and in addition an operative cholangiogram disclosed an aberrant right hepatic duct which also contained multiple calculi. These could not be removed and have since been the cause of repeated bouts of colic. The second case concerns that of a patient with three calculi found at operation in a normal sized duct by a routine cystic duct cholangiogram. As indicated above, the radiologist did not see these calculi (Fig. 4), nor could the surgeon palpate them even though he knew that they were present.

Accuracy of Roentgenological Interpretation

In these 216 proven cases there were 10 errors, an error of 4.6% or accuracy of 95.4% from this investigative technique. As has been indicated, the roentgenological interpretation in three of these 10 cases might have been correct at the time the films were made. Of the 10 errors that were coded, seven were in the first 100 cases examined and only three in the second group of 116.

All these facts indicate that if the radiologist is familiar with this form of examination, and that if it is carefully performed and supervised, its accuracy is of a very high degree.

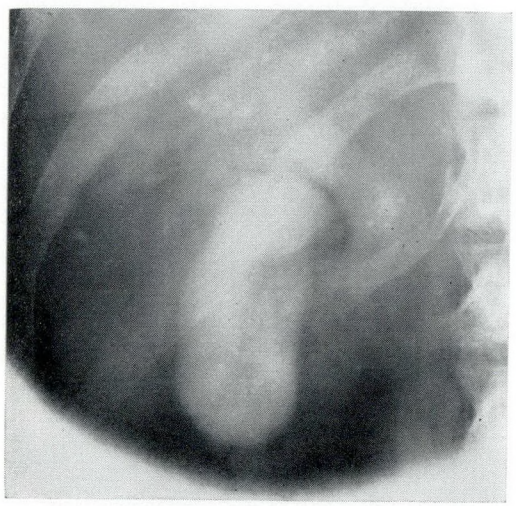

Fig. 3.—Gallbladder normal. Common bile duct containing stones, and enlarged due to œdema of head of pancreas.

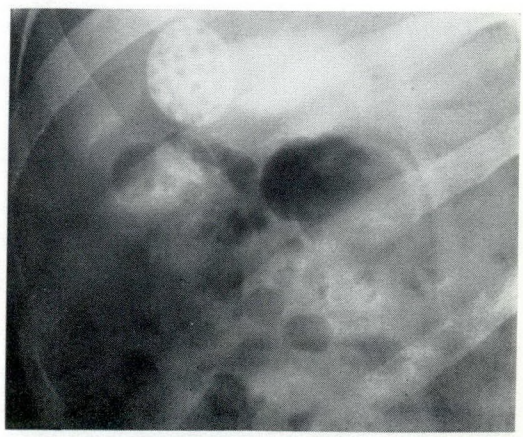

Fig. 4.—Gallbladder containing calculi. Stones present in common bile duct but not visualized by radiologist.

TABLE II.—Section A. Non Opacification of the Bile Ducts. 216 Proven Cases

1.	Biliary tract or liver parenchyma disease	24	
	(a) Impacted calculus, Carcinoma head of pancreas, Œdema head of pancreas — with dilated common bile duct		
	(b) Cirrhosis of liver, Secondary carcinoma of liver, Abscess of liver, Ascending cholangitis		
	(c) Clearing or clinical jaundice		
2.	No known reason	5	13
3.	Common bile duct fistula	2	
4.	Common bile duct packed with calculi and "biliary mud"	1	
5.	Inadequate contraction of sphincter of Oddi	5	

Non Opacification of the Bile Ducts of 216 Proven Cases. Table II.

In 24 of the 216 cases in which the diagnosis was proven, there was either clinical, laboratory or operative evidence of biliary tract or liver parenchyma disease of sufficient magnitude to explain lack of excretion of the opaque medium by the liver, and hence non opacification of the biliary tract. These disorders included one or more of the following (a) dilated common bile duct associated with impacted calculi and/or œdema of the head of pancreas, or carcinoma at the distal end of the duct; (b) liver disease due to cirrhosis, extensive secondary carcinoma, liver abscess or ascending cholangitis, or (c) clinical or clearing jaundice.[3]

In 13 cases, there were no reasons from the operative, clinical or laboratory findings to explain why the opaque medium was not excreted and it is presumed that it actually was excreted. We have no reasons to explain lack of opacification of the ducts in five of these patients. In two, common bile duct fistulae were present which would account for such lack of visualization; in one, the enlarged duct was completely packed with calculi and "biliary mud", and in the other five there was evidence of lack of adequate contraction of the sphincter of Oddi. This evidence consists of opaque medium visualized in the duodenum but none in the biliary tree and/or visualized gallbladder without visualization of the ducts, or a successful repeat examination using morphine sulphate to augment contraction of the sphincter of Oddi.[4]

Section B. The Unproven Cases (381 Examinations, Table III)

Group 1. 114 patients whose gallbladder had been removed

The bile ducts were not seen in eight

TABLE III.—Section B. 381 Unproven Cases

GROUP 1. Gallbladder removed 114	(a) Common bile duct not seen			8
	(i) Cause unknown	1		
	(ii) Biliary tract or Liver disease	7		
	(b) Common bile duct with calculi	6		
GROUP 2. Gallbladder not seen 80	(a) Common bile duct not seen			23
	(i) Biliary tract or liver disease	13		
	(ii) Medium in duodenum	1	Inadequate contraction sphincter of Oddi	10
	(iii) Repeat with morphine	3		
	(iv) Unknown	6		
	(b) Common bile duct with calculi			3
GROUP 3. Gallbladder normal 138	(a) Common bile duct not seen (Inadequate contraction sphincter of Oddi)			2
	(b) Common bile duct with calculi			2
GROUP 4. Gallbladder abnormal 49	(a) Polyp 1, calculi 48			
	(b) Common bile duct not seen (Inadequate contraction sphincter of Oddi)			4
	(c) Common bile duct with calculi			2

of these cases. There was no apparent reason to explain the non opacification of the ducts in one case, but in the other seven there was either laboratory or clinical evidence of biliary tract or liver parenchyma disease (recurrent cholangitis, clinical jaundice or elevated serum bilirubin).[3] In six cases the common bile ducts were considered to contain calculi but to date we have no records of operation in these patients.

Group 2. 80 patients whose gallbladder was not visualized

In 23 of these patients the common bile duct was not seen. There was either clinical or laboratory evidence of liver parenchyma or biliary tract disease in 13 to explain lack of secretion by the liver and hence non opacification of the biliary tract. This evidence included clinical jaundice, known obstruction of the common bile duct, extensive carcinoma of the liver, acute cholecystitis with either cholangitis or pancreatitis, elevation of serum bilirubin, or subsiding jaundice.[3] In one of the 23 cases, opaque medium was present in the duodenum, and in the other nine no reason for lack of its excretion by the liver was apparent from the records. However, since a repeat examination using morphine sulphate to augment contraction of the sphincter of Oddi was successful in demonstrating the ducts in three of these, we are probably permitted to postulate lack of contraction of the sphincter of Oddi in these nine patients.[4]

Only three of these 80 cases showed calculi in the ducts.

Group 3. 138 patients whose gallbladder appeared normal

As the gallbladder was visualized in all of the patients in this group and as the common bile ducts were not opacified in two of them, it was presumed that in these two instances the sphincter of Oddi did not offer sufficient resistance to prevent rapid passage of the opaque medium into the duodenum.[4] Only two patients in this group showed calculi in the common bile ducts.

Group 4. 49 patients whose gallbladder appeared normal

The presence of a polyp was suggested in the gallbladder in one of these cases, and calculi in the remainder. In four the ducts were not seen, suggesting inadequate contraction of the sphincter of Oddi as in group 3, above.[4] The presence of calculi in the common bile ducts was suggested in 2 cases. Some of the patients in this group may have been operated upon elsewhere or may be awaiting operation at a later date.

NON OPACIFICATION OF THE BILE DUCTS OF 381 UNPROVEN CASES, TABLE IV

In 20 of these 381 examinations there was either clinical or laboratory evidence of biliary tract or liver parenchyma disease of sufficient magnitude to explain lack of excretion of the opaque medium by the liver, and hence non opacification of the biliary system. These included recurring cholangitis, clinical or clearing jaundice, known obstruction of the common bile duct, extensive carcinoma of the liver, infectious hepatitis, acute cholecystitis, with cholangitis or pancreatitis or elevation of serum bilirubin.[3]

In 10 patients there was good evidence of inadequate contraction of the sphincter of Oddi as indicated in Section A, and in seven additional cases the reasons for non opacification of the ducts were not apparent, but in these the liver probably excreted the opaque medium nevertheless.[4]

TABLE IV.—SECTION B. NON OPACIFICATION OF BILE DUCTS. 381 UNPROVEN CASES

1.	Biliary tract or liver parenchyma disease	20
	(a) Recurring cholangitis	
	(b) Clearing or clinical jaundice	
	(c) Known obstructed common bile duct	
	(d) Extensive carcinoma of liver	
	(e) Infectious hepatitis	
	(f) Acute cholecystitis with cholangitis or pancreatitis	
	(g) Elevated serum bilirubin value	
2.	Inadequate contraction of sphincter of Oddi	10
3.	No known reason	7

General Analysis (Sections A and B)

Comparison of results from intravenous Cholografin with those of orally administered media.

In 100 of the 597 cases the examination with intravenous Cholografin was successful in visualizing at least part of the biliary tree, following failure of the oral medium (Telopaque) to do so. In 37 of these cases both the gallbladder and the bile ducts were seen, and in 63 cases only the bile ducts were seen. This would indicate the value of Cholografin in attempting to arrive at a correct preoperative diagnosis.

Relationship of serum bilirubin values to opacification of the biliary tract (normal value less than 1.0 mg.%).

Serum bilirubin values were recorded in association with 365 examinations. No opacification of the biliary system occurred in the presence of a serum bilirubin level greater than 1.8 mg. %. In only four cases with serum bilirubin greater than 1.5 mg. % was the biliary system visualized. This critical level is considerably lower than that suggested by other reports.[5,6,12]

A normal serum bilirubin level was not always associated with opacification of the biliary tract. The reason for this is readily apparent when one considers that the bilirubin level is only one index of liver function and that it may have returned to normal while other tests indicated continuing impairment of liver function.

In this series there is no apparent relationship between the size of the ducts and the rapidity or optimum degree of their opacification.

Non Opacification of the Biliary Tract (597 Examinations)

There were no obvious reasons to explain the failure of visualization of some part of the biliary tree in 12 of the 597 examinations (about 2%). This figure might have been further reduced if we had had more complete clinical information, or if these examinations had been repeated using morphine sulphate.

Fifteen, or 2.5% of the total showed definite evidence of lack of adequate contraction of the sphincter of Oddi.[4]

There were two known common bile duct fistulae, and one duct filled with "biliary mud" and calculi.

In 44, or 7.3% there was sufficient biliary tract or liver parenchyma disease to prevent excretion of the opaque medium.[3]

These figures suggest that if one were to exclude those cases in which visualization could not be reasonably expected, and if the radiologist were to supervise carefully each examination, and repeat the examination in selected cases using morphine sulphate, a successful examination could be expected in a high percentage of cases.

In this series of 597 examinations, even including those cases in which opacification would not be anticipated, some part of the biliary system was seen in 89%.

Modifications in Radiographic Technique

The radiographs were reviewed with reference to the initial and the optimum visualization of the ducts and gallbladder. Many of the films which had been taken were found to be unnecessary. In most cases the ducts were seen best on the 30 to 60 minute films. As a result, the routine of radiography has been revised. We now take a scout film, and then take P.A. and oblique films at 10 minute, 30 minute, one hour, two hour and four hour intervals, and discontinue the examination as soon as the necessary information has been obtained. Each film is examined by the radiologist after immediate processing, and any necessary change in technique or positioning is ordered. The use of morphine is limited to repeat examinations, in cases in which the first attempt has not been successful and in which the liver is believed to be capable of excreting the medium. The exposures used for an average patient were 65 K.V. and 150 M.A.S. using cassettes with high speed screens and Potter-Bucky grid (12:1).

This new routine has proved satisfactory, has reduced radiation exposure to the patient, and has allowed the radiographic equipment to be used in the interval between films for other purposes.

Suggested Reasons For Non Excretion of Opaque Medium by the Liver

1. Infectious hepatitis.
2. Secondary malignancy of liver.
3. Cholangitis.
4. Liver abscess.
5. Cirrhosis.
6. Obstructive jaundice.
7. Clearing jaundice.
8. Elevated serum bilirubin.

Suggested Reasons For Non Opacification of the Gallbladder

1. Gallbladder previously removed.
2. Obstruction of or at the cystic duct or neck of gallbladder by calculus, fibrosis or œdema.
3. Fistula from the gallbladder (preventing pooling of the opaque medium).
4. Very small fibrosed gallbladder with practically no lumen (following previous cholecystotomy).
5. Lack of adequate contraction of the sphincter of Oddi (allowing the opaque medium to flow freely into the small bowel[4]).

Suggested Reasons For Non Opacification of the Ducts

1. Duct packed with calculi and/or "biliary mud".
2. Fistula from the duct or previous anatomical interruption of the duct.
3. Lack of adequate contraction of the sphincter of Oddi.[4]

Conclusions

The use of intravenous Cholografin is a valuable and accurate method of examining the biliary system but it should not replace a careful clinical evaluation.

We reaffirm the belief stated in our previous report, that the initial method of radiological examination should be by means of an orally administered medium.

Intravenous examination should be used if the gallbladder has been previously removed or if the desired information regarding the gallbladder or ducts has not been obtained using the oral method.[2]

Errors in interpretation are more likely to occur if opacification of the biliary system is poor.

Examination was not successful in the presence of clinical jaundice or in cases with extensive biliary tract or liver parenchyma disease.[3]

No opacification of the biliary tract occurred if the serum bilirubin value was greater than 1.8 mg. % (and was poor at this level), but a normal serum bilirubin value did not ensure that the examination would be successful.

In selected cases it may be necessary to augment tone of the sphincter of Oddi by the use of a drug such as morphine.

Reasons for non excretion of the Cholografin by the liver, and for non opacification of the gallbladder and biliary ducts have been suggested.

The routine of the examination has been revised, reducing the number of exposures.

Some part of the biliary tract was successfully visualized in 89% of cases, and this figure might have been further improved by more rigid selection of cases and careful supervision of the examination by the radiologist.

No serious reactions to Cholografin were encountered in this series of 597 examinations. Minor reactions such as nausea, vomiting and urticaria were easily controlled by injecting the medium slowly and occasionally by the added use of an "anti allergy" drug.

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Résumé

L'utilisation du Cholografin intra-veineux constitue un moyen d'examen de l'arbre biliaire utile et précis, mais ne devrait jamais remplacer l'évaluation clinique minutieuse.

Cet examen ne devrait être employé que si la vésicule biliaire a déjà été enlevée ou si les renseignements désirés n'ont pu être obtenus par la méthode d'opacification orale. Les erreurs d'interprétation surviendront surtout lorsque l'opacification sera faible.

Dans les cas de jaunisse ou d'atteinte parenchymateuse ou biliaire étendue, l'examen n'a pas été révélateur.

Avec une bilirubine sérique dépassant 1.8 mg. %, l'opacification ne s'est pas produite, quoique sa valeur normale ne soit pas un critère d'opacification certaine. Dans certains cas, il a été nécessaire d'augmenter la tension intra-cholédocienne en se servant de Morphine.

Quelque portion de l'arbre biliaire s'est effectivement visualisée dans 85% des cas; une sélection plus rigide associée à la surveillance étroite du protocole de l'examen par le radiologiste devrait encore donner un meilleur pourcentage.

Aucune complication sérieuse ne s'est manifestée au cours de ces 597 examens. Des réactions sous forme de nausées, de vomissements et d'urticaire étaient contrôlées par l'injection ralentie du médium opaque et par l'addition occasionnelle d'une médication anti-allergique.

CHIRURGIE DE L'ETAGE SUPERIEUR DE L'ABDOMEN. Tactiques techniques opératoires régionales et anatomie évolutive. Henri Fruchaud avec la collaboration de A. Bernou, A.-F. Lemanissier, G. Lessertisseur et G. Videau. 198 pp. Illust. G. Doin et Cie, Paris, 1960. 32NF.

Il y a deux parties à ce livre: la première traitant de l'Anatomie évolutive, la seconde de tactiques et techniques opératoires.

La première partie est intéressante et nous donne une description probablement juste de l'évolution dans la disposition des organes chez l'être humain quand il a adopté la posture redressée.

On comprend bien comment la cage thoracique s'est rétrécie et comment a leur tour les organes abdominaux supérieurs se sont tassés sous un diaphragme qui a acquis chez l'humain une forme différente de celle de l'animal.

Des dessins bien faits nous expriment bien la formation des bandes péritonéales et les moyens de soutien des organes de l'étage supérieur.

La seconde partie démontre l'agrandissement considérable du champ opératoire obtenu par la position du malade sur la table et surtout par l'emploi d'écarteurs orthostatiques qui une fois fixés donnent un jour qui paraît supérieur à tout autre.

Le seul inconvénient semble-t-il est que le colon transverse et son méso et le grand épiploon sont extériorisés et ont perdu droit de cité dans l'abdomen.

Cet état cependant facilite les mouvements de traction qu'il faut exercer au cours des manœuvres opératoires sur les organes situés dans les hypochondres.

Dans les techniques opératoires décrites on insiste surtout sur les avantages anatomiques obtenus par la section des bandes péritonéales qui permettent une très grande mobilisation viscérale.

Le livre est intéressant.

Les tactiques chirurgicales méritent d'être relues.

SURGICAL GASTROENTEROLOGY. Considerations based on Pathologic Physiology. Warner F. Bowers, A.B., B.Sc., M.D., M.Sc., Ph.D. (Surg.), Diplomate of the American Board of Surgery, Diplomate of the National Board of Medical Examiners. 498 pp. Illust. Charles C Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1960. $22.25.

The author has called upon his extensive experience, particularly in the military field, to present a most interesting approach to surgery of the gastrointestinal system. He outlines, under special diagnostic procedures, a positive wealth of information of particular value to the resident surgeon engaged in such clinical evaluations as "diagnostic biliary drainage", "liver biopsy" and "gastroscopy". Preoperative and postoperative care are considered. It would be difficult to discover any congenital or acquired lesion from œsophagus to anus that is not discussed from the point of view of pathological physiology. An attempt is made to explore the reasons why surgery should be considered for a specific condition and to answer the question as to what may be expected from operation.

This volume, which is apparently unique in the field makes a very valuable addition to the library of the gastrointestinal surgeon.

AN ANALYSIS OF OPEN AND CLOSED TREATMENT OF FRACTURES OF THE TIBIAL SHAFT*

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FRACTURES OF THE SHAFT of the tibia have continued to present a problem in management. Although closed reduction and maintenance of position by a cast produces satisfactory results in a large proportion of such fractures, there is still considerable disagreement in respect to methods of internal fixation and advantages and disadvantages of this type of treatment. It has been stated categorically that open reduction inevitably leads to prolongation of healing time, as well as producing a tendency toward other complications, particularly infection. For these reasons, many have adopted an extreme point of view in avoiding open reduction and internal fixation, even in cases which are not well managed by closed techniques.

In an attempt to clarify the relative status of open and closed management of fractures of the tibial shaft, all such cases treated at this hospital during the past eight years have been analyzed with respect to rate of healing and incidence of complications. It must be recognized that such an analysis does not represent a controlled study of various groups with random selection of cases for the respective types of treatment. In general, fractures treated by open methods represent the more severe injuries in respect to degree of comminution and instability. Open reduction has usually been reserved for fractures which were unsuitable for management by closed methods or in which reduction was not maintained by a cast alone. Nevertheless, it was felt that such an analysis would prove useful in determining whether any real disadvantages were apparent with one or other method of treatment.

MATERIAL AND METHOD

A total of 91 fractures of the tibial shaft were treated during the interval studied. The only element of selection of cases for study was in respect to age, patients under 21 years being arbitrarily excluded since fractures in the very young ordinarily present lesser problems in management. In the majority of these cases treatment was carried out by the resident staff, whether by open or closed methods, and the nature of the fracture was not a determining factor in whether the case was managed by the house staff or an attending physician.

RESULTS

Closed Treatment

Twenty-seven patients with simple fractures of the tibial shaft had initial closed reduction and application of casts. In four of these patients a satisfactory position was not maintained and subsequent open reduction‡ was necessary. The remaining 23 patients obtained satisfactory healing without complications.

Twenty-three patients with comminuted fractures had an initial attempt at closed reduction. Seven of these required subsequent open reduction because of unsatisfactory position and the remaining 16 achieved primary union.

Six patients, four with simple fractures, and two with comminuted fractures, were treated by closed reduction with transfixion pins above and below the fracture site incorporated in the plaster cast. Of these, one patient had a delayed union and one patient had non union requiring secondary open reduction and bone graft.

Open Reduction

Twenty-six patients had open reduction and internal fixation by transfixion screws. All of these achieved primary healing except one in whom delayed union occurred, healing in 11 months. In this single case incorrect use of a transfixion screw

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‡Internal fixation was applied in all cases in this series in which open reduction was performed.

TABLE I.—AVERAGE HEALING TIME

	Type of fracture	*Type of treatment*	*Healing time Weeks ± S.D.*
A.	Simple	Closed	14.9 ± 4.6
B.	Simple	Open	16.3 ± 5.0
C.	Comminuted	Closed	18.9 ± 6.8
D.	Comminuted	Open	17.7 ± 5.9

Significance of differences in healing times

A. vs B.:	Not significant	t = .91	.40 P .20
C. vs D.:	Not significant	t = .59	.60 P .40
A. vs C.:	Significant	t =2.14	.05 P .01
B. vs D.:	Not significant	t = .89	.40 P .20

resulted in the fracture ends being held in a slightly separated position.

Of six patients in whom a bone plate was used, two developed osteomyelitis which responded to treatment and two had delayed union which responded well to secondary bone grafts.

Three patients with primary bone grafts obtained primary healing without complication.

The mean time interval from injury to clinical union for the different groups is illustrated in Table I. Healing time was interpreted as the interval from the occurrence of the fracture to the point at which radiographs and physical examination indicated sufficient healing to warrant removal of the cast. For simple fractures the mean interval with closed treatment was 14.9 weeks and with open treatment 16.3 weeks (Table I), a difference which is not statistically significant. For comminuted fractures the mean interval to healing was 18.9 weeks with closed treatment and 17.7 weeks with open treatment. The increased time required for union in the comminuted fractures is statistically significant when compared with the healing time for simple fractures, but the difference in healing time between closed and open treatment of comminuted fractures is not.

In Fig. 1 the individual healing times in the various groups are plotted individually, illustrating the dispersion.

DISCUSSION

Open reduction and internal fixation of fractures of the tibial shaft has been practiced for many years. Because of certain theoretical or actual hazards this method of treatment is ordinarily employed only when there seems little reasonable possibility of achieving a satisfactory result by closed methods. It is difficult to quarrel with this point of view since, at best, any operative procedure involves the risks of anæsthesia and the apparently inevitable, although small danger of infection attendant upon any operative incision. With modern anæsthetic techniques, the hazard of infection would appear to be a more significant danger. It is difficult to assess the effect of prophylactic use of antibiotics on the incidence of wound infection in elective surgery; however, there is no doubt that their use in treating infection has lessened the gravity of this complication.

Perhaps a more commonly considered contraindication to open reduction has been the supposed adverse effect on the rate of healing of the fractures. Urist *et al.*[1] in an exhaustive review of cases of delayed union and non union concluded that simple fractures healed more rapidly than comminuted ones and that compound (open) fractures did not show a prolonged healing time; these conclusions are supported by the present study. However, they also expressed the view that "comminuted fractures of the human adult tibia should be considered non operable fractures during the first six months of healing because the trauma added by surgery exceeds the normal capacity for bone regeneration in this area of the skeleton". This present study does not support the contention that open reduc-

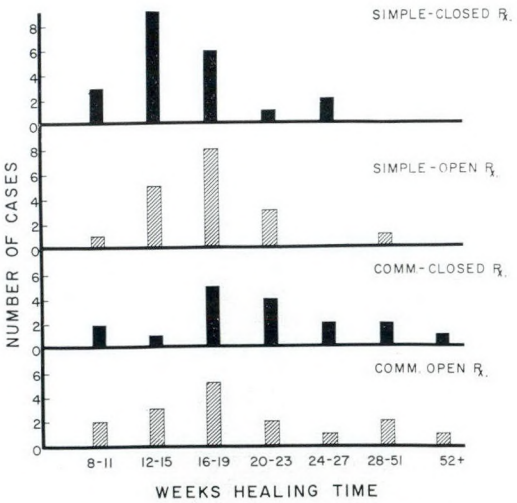

Fig. 1.—Distribution of healing times.

tion *per se* delays the rate of fracture healing. When similar groups of patients are compared, it is seen that the average rate of healing is not significantly different in the groups treated by open reduction and internal fixation from those treated by closed reduction. Therefore, the probability of delayed healing does not appear to be a valid contraindication. It is possible that the previous assumption in this respect has been due to the fact that noncomparable groups of patients were studied and that factors other than the open reduction itself were the determining ones in the delay of healing. The healing time in this series agrees rather well with the studies of Jackson and Macnab[2] who found an average healing time of 17.2 weeks in simple fractures and 21.1 weeks in comminuted fractures treated by closed methods.

Although the development of the slotted plate and its proper utilization has been an improvement, the natural tendency of a plate is to hold the fracture ends in a fixed longitudinal relationship so that resorption of bone at the fracture ends tends to produce a gap between the fragments which will delay healing. This effect also occurs with multiple pin fixation when held in a permanent position such as with plaster, as was seen in this series. This unfavourable effect should not obtain in fractures which are oblique or spiral and can be treated with single or multiple screw fixation. The use of a sliding or onlay bone graft, which may also tend to hold the fracture site separated, produces a compensatory beneficial effect on healing which would appear to offset this disadvantage.

These theoretical considerations are well substantiated by this series and others[2, 3] since uniformly good results were obtained in patients subjected to multiple screw fixation of oblique or spiral fractures or primary bone graft. The early removal of transfixion pins, allowing the fracture ends to move into longitudinal apposition should lessen the complication rate with this type of management.

Although the overall incidence of complications was appreciably higher in patients treated by open reduction, a more detailed inspection of this group of patients revealed that most of the poor results were attributable to a single type of internal fixation, namely the use of a bone plate. Similar difficulties with this method of internal fixation have been reported by others. In assessing the relative merits of various methods of management, the competence of the physician in a particular method of therapy may well be a determining factor and it is possible that this factor may have influenced the results achieved with bone plates in this and other series.

Although primary open reductions frequently have been carried out with success in open fractures, one should expect the risk of infection to be significantly higher in this group and it would appear desirable to obtain primary closure of the wound, with secondary open reduction and internal fixation, when necessary, being carried out after wound healing is accomplished.

Summary

A consecutive series of 91 fractures of the shaft of the tibia has been analyzed with respect to rate of healing and incidence of complications by open and closed methods of treatment. There was a significantly prolonged healing time in simple fractures as compared to comminuted fractures.

Open reduction and internal fixation did not significantly prolong the time of healing over that obtained with closed reduction in comparable types of fractures.

A somewhat higher incidence of complications was observed following open reduction. These complications occurred almost exclusively in those fractures treated by a bone plate which tended to maintain a fixed longitudinal relationship of the fracture ends. Similar difficulties were observed in fractures treated by closed reduction with transfixion pins incorporated into a cast.

It is suggested that when carried out in optimum fashion, internal reduction may be performed without any inherent disadvantage in relation to rate of bone healing and that the incidence of complications should be low.

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RÉSUMÉ

Une série de 91 cas de fractures diaphysaires du tibia a été étudiée pour comparer la vitesse de guérison et l'incidence des complications selon le mode de réduction fermée ou ouverte. Les fractures simples ont guéri plus lentement que les fractures "communitives".

Dans les cas de fractures comparables, les deux moyens de réduction ont donné une vitesse de consolidation superposable. Les complications ont été plus fréquentes dans les cas de réduction ouverte. Celles-ci sont survenues presqu'exclusivement dans les cas de plaques qui visaient à immobiliser l'axe longitudinal des extrémités fracturées. Les mêmes échecs furent cependant essuyés dans les cas de réduction fermée, avec broches incorporées dans les plâtres.

Il ressort que, pratiquée dans des conditions idéales, la réduction sanglante soit acceptable, en ce qui concerne la vitesse de guérison, et que les complications dussent être peu fréquentes.

GEOGRAPHY AND MEDICINE*

"A few centuries ago the Black Death took some ten years to travel from the Orient to western Europe; today an influenza outbreak in a remote Chinese town can spread around the world within weeks.

"Geography has always played a vital role in health and disease, as Hippocrates well knew, but in this modern jet age it has become an integral part of world medicine. Pathogens can now circle the globe in less time than it takes some infectious diseases to incubate. Contrariwise, epidemiologic health teams can descend on an infectious area in a matter of hours, before disease has had time to spread. The winged insect carriers are frequently defeated by man-made winged instruments.

"The earliest form of human being probably began to develop a million years ago, long after the main geographic contours of the earth had been formed. There is a good deal of evidence that Central Asia or Africa were the cradles of the most primitive men.

"If these creatures lived in trees with their anthropoid cousins, any upheaval or change of climate that destroyed forests would force humanids to walk on the ground and develop new postures and skills. Example: some anthropologists believe that the Himalayan range was responsible for reducing rainfall to the north, thus causing forests to shrink toward the south and ultimately disappear.

"Similarly, as the changing pattern of vegetation and rainfall transformed verdant plains into deserts, man and beast moved northward and westward eventually entering Europe. The retraction of the icecap around 20,000 years ago changed the nature of the top soil, profoundly affected the course of rivers and transformed the climate over a vast area. This might be called the last geographic upheaval.

"Primitive human communities now had the choice of several locations: mountainous caves, plains, river valleys, seashores. The peculiar flood and ebb pattern of the Nile made it possible for wild grain (millet, barley) to grow in the warm mud during the winter, also produced a natural system of fertilization and irrigation. Along this river and the great rivers Tigris and Euphrates, were founded the earliest civilizations, apparently entirely by geographic chance.

"The ancient riparian cultures gained some control over geographic forces through primitive dams and irrigation canals, but they were vulnerable to serious climatic changes. Repeated floods in the Mesopotamian basin around 4500 B.C. forced the abandonment of some towns; receding flood waters furnished breeding areas for malarial mosquitoes, contaminated waters may have spread dysentery, cholera, typhoid. One early Babylonian visualized a dark dragon lurking in waters left by a flood. In Egypt, droughts and locusts brought famine; the Nile itself transmitted water-borne infections, and early canals harbored the snail vectors of schistosomiasis. . . ."

*MD OF CANADA, **1:** 36, 1960.

GALLBLADDER DISORDERS IN THE YOUNG*

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THERE HAVE BEEN 500 cases of cholecystitis with or without cholelithiasis in children or adolescents on record in the whole of surgical literature. Yet there are good reasons to believe that the frequency of this disease is even greater than that which may be deduced by the number of reported cases. Consideration of this disease should enter into the differential diagnosis of obscure abdominal ailments of young patients even if only to be excluded.

Hopmans[1] reported an acute cholecystitis in a six year old boy with concomitant right lower lobar pneumonia. In one series reported by Gross,[2] three of the six patients with cholecystitis also suffered from hæmolytic anæmia. Barnes[3] described a case of acute cholecystitis in a four year old child. A cholecystotomy was first performed and the gallbladder was removed 16 months later since the symptoms and signs had returned. Of Glenn's seven young patients seen at the New York Hospital,[4] one had stones. Lary[5] reported an acute non calcareous cholecystitis with associated mesenteric adenitis in a child. Walker[6] reviewed nine cases in this age group taken from a 15 year period at the Great Ormond Street Hospital. Death of a 14 year old girl was described as resulting from a stone in the common duct with obstructive jaundice, secondary acute inflammation of the biliary tract and subsequent staphylococcal peritonitis. The incidence of common duct stone in cases of cholelithiasis in this age group is estimated at about 4%.[7, 8]

As more information is being gathered on the subject, there is less unanimity among the various theories on ætiology. At the turn of the century, all gallstones in the young were thought to be associated with familial acholuric jaundice. Nowadays, congenital hæmolytic anæmia is not considered so important in causing gallstones, nor are the acute systemic diseases such as typhoid, scarlet fever or other similar infections, as they are less frequent and more easily controlled than they ever were in the past. Tesler[9] mentioned a genetic factor in writing about the occurrence of this disorder in identical twins. Hereditary predisposition has its supporters, as does neonatal sepsis. The finding of stones in the fœtus has been linked to intrauterine cholecystitis and erythroblastosis fœtalis. Other ætiological factors may include sickle-cell anæmia in negroes, the rhesus factor and cystic duct obstruction by an enlarged cystic lymph node. In pointing out that gallstones are less frequently encountered in India than they are in Europe or North America, Ansari[10] wondered whether or not the influence of dietetic factors played any part in their formation. Sodeman[11] suggested that absence or dearth of bile salts caused precipitation of cholesterol; Dannenberg[12] observed that agglutinins favoured bile precipitation which could lead to stone formation. Gallstones in children are usually pigmented with cholesterol and bilirubin as organic components, and lack phosphates, bicarbonates, or calcium. Finally, biliary dyskinesia was suggested by Rankin[13] as an ætiological factor.

In 1941, Ladd[14] thought that before puberty, cholelithiasis was more common than cholecystitis. More recently, Ulin[15] and his associates implied that girls are more susceptible than boys. Babbitt[16] postulated that stones were less frequently silent in the young than in adults. Judging from the information reported on this age group in the literature to date, there seems to be only a nebulous relationship between cholecystitis and cholelithiasis.

Which clinical features may lead to the correct diagnosis? The young patient may present with persistent nausea, vomiting, abdominal pain, diarrhœa and jaundice. This last feature may occur without the presence of a stone in the common bile duct. Back and shoulder pain is said to be rare, possibly because the mechanism of referred pain may not be completely developed at this age. Moreover, pain localization is never easy in examining young

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*This paper was written when the author was on the Resident Surgical Staff, St. Paul's Hospital, Vancouver, B.C.

children. Laboratory findings need not be confirmatory. If the patient has passed puberty a serum amylase level determination may be helpful in cases of cholecystitis when concomitant pancreatitis is suspected; in younger children, the test is of little value.[17] Patients have been discharged with a diagnosis of hepatitis only to be readmitted to hospital a few months or a few years later with cholecystitis or cholelithiasis requiring operation. Since the advent of antibiotics, associated infections are not so frequently seen as they were in the past. The physical signs may be perplexing as often as they are indicative. The gallbladder, liver and spleen may or may not be palpable. Radiological investigation should be employed if the clinical diagnosis is in doubt.

Therapy was formerly conservative because of the frequency of associated infections. It was felt that if the latter could be cured, the gallbladder involvement would regress spontaneously. Cholecystectomy is now the treatment of choice; cholecystotomy should only be used as a life saving measure. Gallstones in the presence of hæmolytic anæmia pose a surgical problem; if the stones are quiescent and do not obstruct the duct, splenectomy should be done first. If the reverse condition exists, cholecystectomy with or without choledochostomy is indicated and the spleen should be left untouched until a subsequent intervention. Fifteen years ago, Waugh operated on a young patient with hæmolytic anæmia and gallstones but without jaundice or cholecystitis, removing the spleen first; as the patient was in excellent condition, the surgeon immediately extended his transverse incision to the right, and performed cholecystectomy. Convalescence was uneventful.[18] Thus it is safe to predict that as operative and anæsthetic techniques advance, simultaneous removal of the spleen and gallbladder will, when necessary, become a one-stage procedure.

Case Reports

Case 1.—A girl 12 years of age was transferred from Ocean Falls Hospital to St. Paul's Hospital, Vancouver in October 1959, with a diagnosis of cholecystitis and cholelithiasis. She gave a three year history of attacks of epigastric pain, at first occasional and nocturnal, never related to meals, lasting from one to four hours and usually relieved by vomiting. Later these attacks began to take place immediately after meals; they were only partially relieved by vomiting and not affected by alkalis. She did not report any food intolerance, nor was her appetite affected by the attacks. Although she had been constipated for several years her stools had never been pale; her urine had never been dark and she had been perfectly well between bouts of pain. Two weeks before admission to St. Paul's Hospital she had suffered a severe attack of pain with radiation to the right shoulder. Partial relief was obtained several hours later when she vomited three times. Physical examination on the previous admission had revealed a yellow tinge to her skin. A tentative diagnosis of acute cholecystitis was made. Pain subsided after 24 hours but tenderness remained in the epigastric and right subcostal regions for several days. No family history of gallstones or hæmolytic anæmia could be elicited. The child had always been in good health and had begun menstruating at the age of 10 and one-half years.

She was an obese, well developed 12 year old girl, weighing 148 lb. and was in no acute discomfort. She was not jaundiced. No abdominal tenderness could be elicited; the liver, spleen and gallbladder were not palpable.

Laboratory Investigations

On admission, her hæmoglobin level was 95%, and her white blood count was 9050 per c.mm. with a normal differential count. The serum bilirubin level was 9.6 mg. %; serum phosphorus, calcium and alkaline phosphatase were normal and there was no porphyrin in the urine. No mention of spherocytes was made in the report of the microscopic examination of the blood. A cholecystogram was attempted twice but each time the gallbladder failed to concentrate the contrast medium.

A cholecystectomy and an appendectomy were performed four days after admission. The gallbladder was thickened, chronically inflamed and contained about 50 mixed stones, several of which were impacted in the cystic duct.

Postoperative course was uneventful and the patient is now well. The surgeon feels that this girl may have further stones formed in her biliary system in the future.

Case 2.—A 15 year old girl was admitted in early January 1960, complaining of right upper quadrant pain for the previous three

months. She had been admitted once before in St. Paul's Hospital, Vancouver in October 1959, and had been found to have a non functioning gallbladder. The diagnosis then was biliary colic and obstructive jaundice, but her parents having refused permission for operation, the patient was discharged to her home. Pain radiated between her shoulders and was associated with chills and fever. She had had intermittent bouts of jaundice and noticed frequent passing of dark urine in the six weeks before admission. Since her discharge in October 1959 the patient had been feeling rather weak and was not eating well.

Past history of this girl included an attack of pleurisy and pneumonia several years ago, and "ovulatory" difficulty in 1956. At that time, she had been admitted to hospital with a provisional diagnosis of acute appendicitis having had a fever and some pain in the right lower quadrant. Her physical examination was then normal and her leukocyte count was only 8600 of which 64% were neutrophiles and 25% band cells.

Physical examination at this time revealed a well developed girl presenting with epigastric and right upper quadrant tenderness and a positive Murphy's sign. Her Hb. level was normal and serum cholesterol was 145 mg. %. No spherocytosis was seen in the peripheral blood.

The patient was operated upon on January 12, 1960, and a small mucocœle of the gallbladder was found with no stones in the common bile duct. A cholecystectomy and an appendectomy were performed after stones were palpated in the gallbladder. Histological examination reported a subacute cholecystitis, cholelithiasis and chronic appendicitis. Her recovery was uneventful and convalescence at the time of writing has been uncomplicated.

CASE 3.—A 19 year old married woman was admitted to the emergency department of St. Paul's Hospital on March 7, 1960. She complained of severe upper abdominal crampy pain with nausea and vomiting. In the three months preceding admission she had suffered five similar attacks, unrelated to meals, bowel movements or micturition. Pain radiated to the mid-back in the right subscapular region. There was no history of dark urine or pale stools. The patient had had an appendectomy in the past and, except for an episode of jaundice in her youth, had always been well. She had no children. There was no familial history of blood disorders or splenectomies.

On admission, her temperature was 98.3°F. pulse 84 and blood pressure 118/70 mm. Hg. There was marked tenderness in the right subcostal area, and Murphy's sign was positive. Bowel sounds were present in all abdominal quadrants. A tentative diagnosis of acute cholecystitis was made.

A cholecystogram performed three weeks after admission showed no opaque stone, but the faintly concentrated dye was sufficient to outline several radiolucent calculi measuring about 5 mm. in diameter. The gallbladder contracted normally after a fatty meal. The results of routine laboratory tests on blood and urine were reported as being within normal limits. The test of erythrocyte fragility was normal. Serum bilirubin level was below 0.5 mg. %.

At operation on April 4, 1960, the gallbladder appeared moderately inflamed. It contained six mulberry calculi but none was found in the common duct. Pathological examination of the organ confirmed the clinical impression of chronic cholecystitis with cholelithiasis.

The postoperative course was smooth, although the apprehensive nature of the patient made mild sedation necessary.

DISCUSSION

A search of the records of St. Paul's Hospital, Vancouver, over the past 10 years discloses eight other legitimate cases pertinent to this article. A 16 year old girl was admitted with a diagnosis of cholecystitis and underwent cholecystectomy. The diagnosis was confirmed by microscopic examination of the gallbladder in which there were no stones. Seven other young women, between 15 and 20 years of age, had both cholecystitis and cholelithiasis. Of these, two had children and one of the patients was seven weeks postpartum at the time of operation. In these two patients, radiological examination had failed to reveal a functioning gallbladder. A stone was seen on the film of the 15 year old girl. Although she had been diagnosed as having hepatitis and appendicitis before admission, operation revealed cholecystitis with cholelithiasis and appendicitis. The gallbladder and appendix were removed and the patient made an uneventful recovery. A 20 year old woman who had hydrops caused by a stone in the cystic duct was cured by cholecystectomy with T-tube drainage of the common bile duct. The other three patients treated surgically were also women and all three had stones. In no case was familial

hæmolytic jaundice present in this series. There was no evidence of splenomegaly in any of the patients operated upon, nor was there any sign of hæmolytic anæmia in the reports of the laboratory tests performed before operation.

Five patients were treated conservatively. An 11 year old boy who had a non functioning gallbladder on radiological examination, responded to a fat free diet and other conservative therapy without any acute recurrence of his disease for at least 19 months (up to the time of writing). The only other patient suspected of having stones in the cystic duct was a two year old baby, whose radiological examination showed a non functioning gallbladder with calcified lymph nodes around the cystic duct. He was also treated conservatively and has not been readmitted in the past two years. The remaining three patients treated conservatively were all young women, two of whom were pregnant (a 17 year old mother at five months and a 19 year old mother at eight months). The third patient, who was four months postpartum, was icteric on admission. Pain, nausea and jaundice disappeared during her stay in hospital. Cholecystograms were performed on five of the conservatively treated patients after disappearance of their jaundice; in spite of double doses of contrast medium no gallbladder shadow could be detected.

Hospital records contained 20 additional cases of cholecystitis and cholelithiasis, but none of these was included in the present series, as they did not prove acceptable by our criteria. We included only cases in which disease was confirmed by pathological examination of the surgical specimen, or by failure of gallbladder visualization at radiography after administration of a double dose of dye, when jaundice had subsided.

Samson[19] reviewed cases of proven gallstone in 20 patients under 21 years of age operated upon at Hôtel-Dieu of Quebec; 18 of these were in girls or young women; the average age in this series was 16.3 years. Intercurrent infections were rare; one baby girl only three years old, appeared prone to develop influenza-like attacks. Another patient had a common bile duct exploration with Cattell tube in place for five months. None of these patients presented with splenomegaly or congenital hæmolytic anæmia.

Conclusion

The incidence of cholecystitis and cholelithiasis in the young may be higher than generally conceded; as more information is gathered on the various aspects of the malady, any dogmatism which may have been expressed in the approach to this problem in the past, is precluded.

It appears from the evidence presented above that gallstones are more common in young women than they are in young men under the age of 21. Cholelithiasis is more frequent in this section of the population than cholecystitis alone. In our operative series of 10 patients, nine had stones and only one had inflammation without calculus. None of our patients presented signs of hæmolytic anæmia. The gallbladder should be palpated and visualized at operation in all young patients suspected of suffering from appendicitis, regardless of mesenteric adenitis, or if the appendix looks normal. If this procedure were uniformly carried out, results might be startling.

The possibility of gallbladder disease should be kept in mind in all cases of this age group, presenting with abdominal ailments of obscure cause.

Summary

A short survey of cholecystitis and cholelithiasis in the preadult age group has been presented with mention of ætiological theories, symptoms, signs, routine investigation of diagnosis and therapeutic approaches. Three new cases are presented with a 10 year review from the files of St. Paul's Hospital in Vancouver, and a similar 10 year survey from a hospital of approximately the same size in the Province of Quebec.

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Résumé

La littérature chirurgicale a rapporté jusqu'à maintenant, 500 cas de cholécystite, avec ou sans calcul, chez les jeunes, mais nous croyons son incidence plus élevée que ne le suggèrent ces rapports, à tel point que nous considérons la maladie dans le diagnostic différentiel des syndromes abdominaux obscurs de nos jeunes malades, même si n'est que pour l'exclure.

Du point de vue étiologique, il n'y a guère d'unanimité. L'anémie hémolytique congénitale, non plus que les maladies systémiques, doivent être considérées comme causales. Les pigments biliaires, plus que les sels, constituent les calculs.

Cliniquement, le jeune malade peut accuser un état nauséeux, des vomissements, de la douleur abdominale, de la diarrhée et de la jaunisse: celle-ci peut être présente sans calcul du cholédoque. La douleur irradiée est exceptionnelle.

Objectivement, l'examen peut être aussi souvent révélateur que négatif. On doit recourir à la cholécystographie au moindre doute. La cholécystectomie est le traitement de choix.

De la série des cas étudiés, il ressort que les calculs biliaires soient plus fréquents chez les jeunes femmes que chez les jeunes hommes de moins de 21 ans, et que la lithiase soit plus fréquente que la cholécystite simple; en effet, de nos 10 cas opérés, neuf avaient des calculs, alors qu'un seul présentait une inflammation sans calcul. Aucun de nos patients, en outre, ne manifestait d'anémie hémolytique.

HIATUS HERNIA AND PEPTIC ESOPHAGITIS FOLLOWING TRAUMA*

". . . Although a congenital short esophagus is mentioned frequently in surgical literature as a cause of hiatus hernia, in practice this is a very rare finding. The short esophagus usually is more apparent than real, easily reducible and is on the contrary *a posteriori* of hiatus hernia rather than its cause. The diagnosis of short esophagus is usually made following x-ray examination. The cardio-esophageal junction presents above the diaphragm and in association with a hiatus hernia of the sliding variety. This apparent short esophagus is probably due to the contraction of the longitudinal muscle fibers of the esophagus with a 'give' from the mobilized proximal end of the stomach. Although the radiologic diagnosis is a short esophagus, the surgeon has no difficulty in reducing the hernia and restoring the cardia below the hiatus unless esophageal stenosis and stricture resulting from peptic esophagitis is very far advanced.

"That the initial factors may be rather a weakness in the diaphragmatic crus, in the phrenoesophageal ligaments, in the so-called 'intrinsic esophageal sphincters', in the angulation of the esophagus into the cardia or in other structures whose integrity maintains the competence of the hiatus, or a combination of these factors, can only be postulated at the present time. . . ."

*Friedman, A. I.: *Am. J. Gastroenterol.*, **34:** 169, 1960.

CASE REPORTS

LEFT EPARTERIAL BRONCHUS: A RARE DEVELOPMENTAL ANOMALY OF THE BRONCHIAL TREE*

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ALTHOUGH a left eparterial bronchus is normally present in such animals as the camel, giraffe, hippopotamus and seal, such an arrangement of the bronchial tree of the left lung in man is rare. Brock[1] makes no mention at all of a left eparterial bronchus but states that the only common variant in the left upper lobe is "fusion of the pectoral and lingular bronchi". Boyden[2, 3] reported five cases of left eparterial bronchus and stated that to date he had not been able to find any previous reports in the literature. Wells[4] has added a further case report in which there was not only a left eparterial bronchus but a completely tri-lobed left lung, an exact replica anatomically of the right lung.

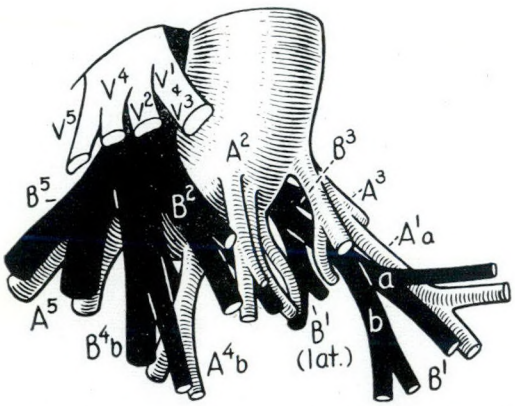

Fig. 1.—Reproduced from Boyden, E. A. and Hartman, J. F. (By kind permission of the publishers of the American Journal of Anatomy).

Boyden[2] believes that the anomaly is the result of the outgrowth of an ectopic bronchial bud high up on the left primary bronchus above the level of the developing left pulmonary artery. This ectopic outgrowth is followed by, or accompanied by the appearance of a lower division bronchus on the caudal side of the artery. The striking feature of the anomaly is the ectopic position of the left pulmonary artery which enters the left upper lobe between these two bronchial stems which arise separately from the left main stem bronchus (Fig. 1).

Boyden[2] described a case exactly similar to ours in which the left upper lobe was split by the pulmonary artery into two segments; the upper (or eparterial) stem supplied the apical and posterior segments and passed behind the left pulmonary artery; the lower stem passed anterior to the pulmonary artery to trifurcate into an anterior bronchus, and superior and inferior lingular bronchi (Fig. 2).

CASE REPORT

A 30 year old white man was admitted to

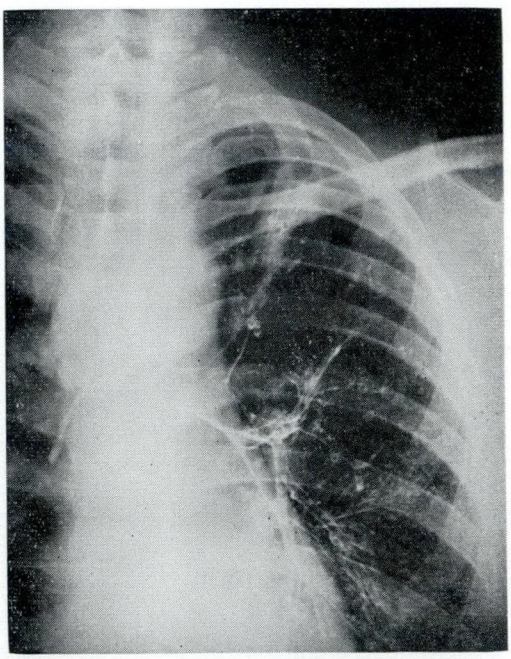

Fig. 2.—Bronchogram revealing eparterial bronchus supplying apico-posterior segment of left upper lobe.

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†Associate Professor of Surgery, Queen's University, Kingston, Ont.

the Ongwanada Sanatorium, Kingston, with a one year history of recurrent hæmoptysis. Chest radiographs showed cavitation of the left apex. The sputum revealed tubercle bacilli by smear and culture. After five months of drug therapy cavitation persisted; therefore surgery was recommended. A preoperative bronchogram revealed a left eparterial bronchus supplying the cavitated apicoposterior segments (Fig. 2). Thoracotomy confirmed the arrangement mentioned above in that the left eparterial bronchus supplied the apical and posterior segments of the left upper lobe and this stem bronchus passed behind the left main pulmonary artery, while the stem bronchus supplying the remainder of the left upper lobe lay anterior to the artery. The diseased segment was removed in the usual manner and the postoperative course was uneventful.

SUMMARY

A left eparterial bronchus is reported in a 30 year old man suffering from pulmonary tuberculosis. This rare anomaly was demonstrated by bronchography and confirmed by surgical resection. Although this is only the seventh case of left eparterial bronchus reported, it is probable that this does not represent the true incidence of the anomaly.

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RÉSUMÉ

Un cas de bronche épartérielle gauche chez un homme de 30 ans qui souffrait de tuberculose pulmonaire est rapporté. Cette rare anomalie fut démontrée par bronchographie et confirmée à l'opération.

Même si ceci ne constitue que le septième cas de bronche épartérielle gauche rapporté, il est probable que cette anomalie ne soit pas représentée sous sa véritable incidence.

A REPORT OF 16 TUMORS OF THE SPINAL CORD IN CHILDREN: THE IMPORTANCE OF SPINAL RIGIDITY AS AN EARLY SIGN OF DISEASE*

"The occurrence of tumors involving the spinal cord in children is frequent enough to require the vigilance of all who are in pediatric practice. Commonly, early signs are missed and the diagnosis delayed until irreparable damage has been done. The apparent rarity of the disease is belied by the fact that more than a dozen articles related to it have been published during the last ten years.

"In most cases, the reward of diagnosis, even tardy, may be relief from intractable pain with complete remission of symptoms for many years or for life. Errors in diagnosis may result in progressive paraparesis and death.

"Although Ross and Bailey comment that 'the prime requisite for recognition of a spinal cord tumor is suspicion of its existence', it is rare for suspicion to be aroused without previous association with a case of spinal cord tumor. In the numerous reports in the literature the comment that tumors of the spinal cord may be about one-fifth as common as intracranial tumors under the age of 12 years would suggest that a pediatrician will rarely encounter such a tumor in his practicing life. If such a case does present, he may, in spite of careful examination and other investigations such as x-rays, fail to make the diagnosis and may even deny that the symptoms had any organic basis.

"The course of these tumors is too variable to permit an accurate estimate of prognosis either pre- or postoperatively, except on rare occasions. The major exception is when systemic disease, particularly of a malignant nature, has presented itself with involvement of the spinal cord or vertebrae. Thus the prognosis in any given child is individual and dependent upon the length of the history, the degree of neurological deficit, the nature of the lesion if determinable histologically, the extent of the tumor at the operation and the possibility of its removal, and the postoperative recovery and subsequent course. . . ."

*RICHARDSON, F. L.: *J. Pediat.*, **57:** 42, 1960

PERICARDIAL FAT NECROSIS*

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MEDIASTINAL TUMOURS and cysts are being diagnosed correctly more often than formerly because of improved radiological techniques and because thoracotomy is now a recognized diagnostic procedure. With experience, the type of mediastinal tumour or cyst can usually be diagnosed preoperatively from its anatomical location in the mediastinum. Thoracotomy may be necessary to make the final diagnosis. The following case of pericardial fat necrosis is reported because it represents a rare clinical entity and must be considered in the differential diagnosis of a mediastinal lesion.

CASE REPORT

A 56 year old man was referred to the Winnipeg Clinic on December 8, 1958, because a lesion had been discovered in the right chest on routine radiological examination (Fig. 1).

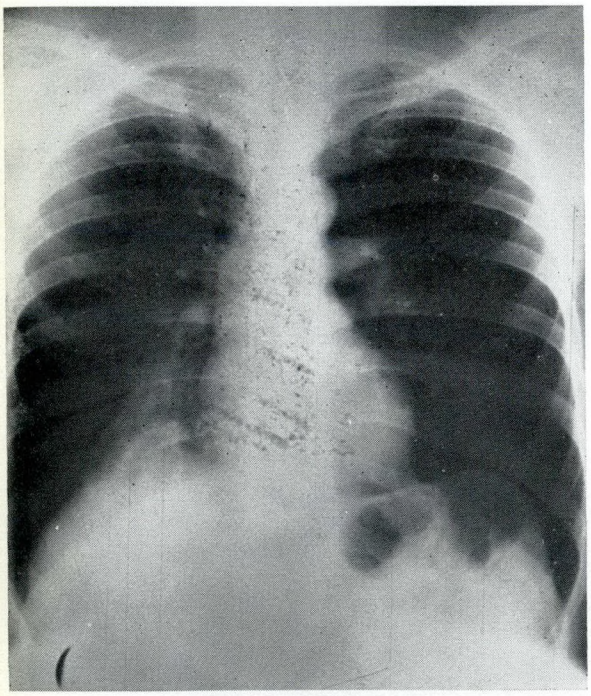

Fig. 1.—Routine radiograph showing lesion in right costophrenic region.

*From the Departments of Surgery of the Winnipeg Clinic, The Winnipeg General Hospital and the University of Manitoba, Winnipeg.

This patient had complained of a slight cough associated with a tickling sensation in the throat which had been present for a few years. He had no pain at the time of his first examination. However, two months earlier, he had an acute attack of pain in his right anterior chest below the right nipple. This pain radiated to the axilla and right supraspinatus area and lasted for 10 days. Deep breathing, sneezing and coughing aggravated the pain. He felt ill, but failed to take his temperature.

Physical examination was essentially negative. The laboratory findings were as follows: Urine—clear; hæmoglobin—15 g. %; sedimentation rate—40 mm. per hour. The radiological report on the chest was as follows: "There is an oval shaped density lying in the anterior inferior portion of the right middle lobe, measuring 8 x 5 x 5 cm. This does not seem to pulsate. The diaphragm moves freely in the region of the density, although its inferior margin cannot be separated from the diaphragm during fluoroscopy. However, it was seen that this mass changed shape as the diaphragm descended." A barium swallow showed that the œsophagus had no relationship to this mass and a barium enema failed to show large bowel herniation through the diaphragm.

The patient was admitted to the Winnipeg General Hospital on January 12, 1959, for bronchoscopy and further investigation of the mediastinal shadow. The tracheo-bronchial tree was found to be clear.

On January 15, 1959, a right thoracotomy was performed in the interspace between the fifth and sixth rib. On exploration the right lung was normal. There was a firm, yellowish mass lying in the diaphragm, adherent to the pericardium and to the base of the lower lobe of the lung. The mass was removed by freeing it from the base of the lung, the diaphragm, and finally from the pericardium. Bleeding points were ligated, the lung inflated, and a rubber tube was placed in the pleural cavity. The chest wall was closed in layers.

The patient made an excellent recovery and was discharged from the hospital 10 days later. On his last visit to the Clinic in July 1959, he felt perfectly well and had no chest pain.

PATHOLOGICAL REPORT

"The tissue removed consisted of a well demarcated discoid mass, measuring 9 x 7 x

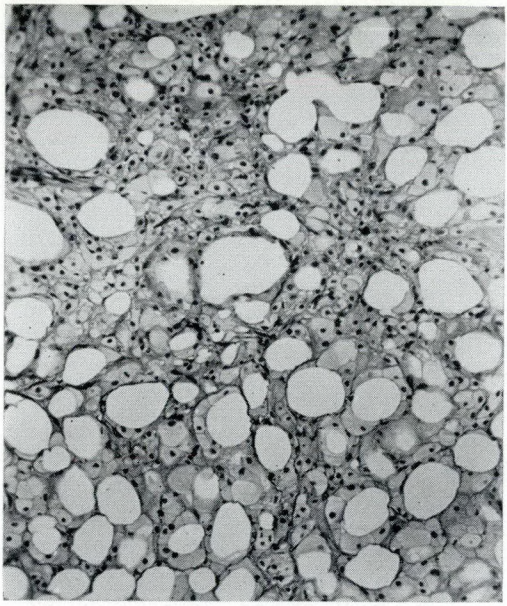

Fig. 2.—Low power photomicrograph to show general configuration of lesion (x 10).

1.5 cm. On section, it was variegated yellow and white. It appeared to be encapsulated and was firm to cut. Microscopically, it was limited by an ill defined capsule. The mass consisted of fat showing various stages of fat necrosis, but this process involved the whole lesion (Fig. 2). Of interest were numerous large vessels, mainly small arteries. Some of these showed intimal proliferation and others well marked medial hypertrophy (Fig. 3). The lumen in these vessels, though normal, seemed larger and out of proportion to the supplied area."

Discussion

This lesion has occurred in patients of middle age. The illness starts as an acute anterior chest pain of a pleuritic character and may even produce a pleural rub. After the acute phase the pain changes to a dull persistent ache. It has been reported[2] that pain was so severe that shock and a cardiac arrhythmia developed simulating a coronary occlusion. The radiographs of the chest demonstrate a mass in the cardiophrenic angle, spreading over the diaphragm, interpreted as lying in the area of the middle lobe.

Jackson, Clagget and McDonald[1] reported three cases and emphasized the vascular changes occurring in the pathological specimens of the surgically removed

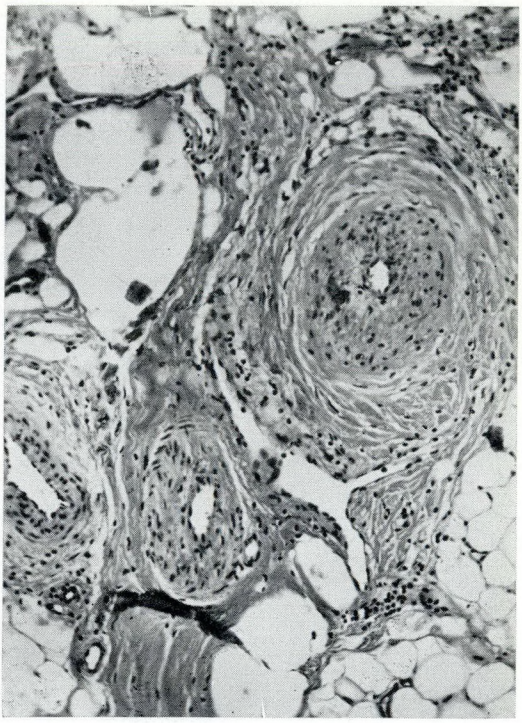

Fig. 3.—High power photomicrograph showing small arteries with intimal proliferation (x 90).

masses of fat necrosis. They considered various ætiological factors but concluded that they had no particular theory to offer.

Chester and Tully[2] described an earlier stage of the lesion, i.e. 13 days after the acute onset of symptoms. "Histologically, the changes were due to extravasation of blood, ischæmic fat necrosis and fibrosis."

Dr. Hugh Ross, pathologist at the Winnipeg General Hospital[3] made the following comments regarding this case: "There are two features of interest. The well defined capsule and the discrete appearance of the lesion is quite consistent with the diagnosis of a lipoma showing fat necrosis. The large abnormal vessels are suggestive of those found in hamartomata in various locations. It is interesting to speculate that these lesions begin as a tumour, such as a lipoma and because of the peculiar location, are subjected to the trauma of the beating heart and the moving diaphragm."

Summary

A case of fat necrosis involving the parietal pericardial fat is reported.

Pericardial fat necrosis is a new clinical entity that must be considered in the differential diagnosis of mediastinal masses.

The patient whose case is reported presented with a dull ache in the right anterior chest, following an episode of acute anterior chest pain eight weeks previously. The pain suggested a pleuritic lesion.

At thoracotomy, a mass of pericardial fat necrosis was found and removed.

To the best of our knowledge only four cases have been reported[1, 2] in the literature.

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Résumé

Avec l'expérience, le genre de tumeur médiastinale peut habituellement, selon sa localisation, être diagnostiqué pré-opératoirement quoique dans certains cas une thoracotomie soit nécessaire.

Un homme de 56 ans nous fut référé en décembre 1958 pour une lésion intra-thoracique droite découverte à la suite d'une radiographie de routine. Ce malade, qui n'accusait aucun malaise lors de l'examen, avait cependant éprouvé, deux mois plus tôt, une violente douleur sous-mammelonnaire droite, irradiée à l'aisselle et à la région sus-épineuse droite, qui avait duré 10 jours et qui était accentuée par la respiration, l'éternuement et la toux. Radiologiquement, il existait une densité ovalaire à la portion inférieure du lobe moyen droit qui n'était pas pulsatile, mais qui, à la fluoroscopie, changeait de forme avec les mouvements du diaphragme.

Une thoracotomie dans le 5e espace droit démontra un poumon normal et mit en évidence une masse jaunâtre ferme reposant sur le diaphragme et adhérente au péricarde et à la base du lobe inférieur. Cette masse fut enlevée par libération de ses adhérences.

Au microscope, cette masse possédait une capsule mal définie et était constituée de divers stages de nécrose graisseuse (Fig. 2). Elle montrait, de plus, de nombreux vaisseaux, surtout des petites artères, semblant hors de proportion avec le tissu à irriguer, ce qui amena le Dr Hugh Ross, pathologiste du "Winnipeg General Hospital", à commenter que ces vaisseaux anormaux rapellent ceux que l'on trouve dans les hamartomes.

Au meilleur de notre connaissance, seulement quatre cas de nécrose graisseuse péricardique ont déjà été rapportés.

JAMES HENRYSOUN: CHIRURGIAN TO THE POORE*

"James Henrysoun, barber surgeon, who practised in Edinburgh during the later sixteenth and early seventeenth centuries, has sometimes been referred to as the first Medical Officer of Health for the city. *Mutatis mutandis* —which is saying a good deal—there may be some justification for this, though in reality his position was rather that of a poor-law medical officer. Even during outbreaks of plague, when he was called upon for duties that today would be performed by the M.O.H., his functions were clinical rather than preventive. He belongs to a period when some, at least, of the larger communities were beginning to realize the advantage of having a medical man to whom they might apply for advice, even though the nature of his appointment and the extent of his duties might be somewhat loosely defined.

"Of Henrysoun as an individaul little can be said. He published nothing, he left no memoirs or correspondence, and his name is not associated with any special contribution to medical theory or practice. We know of him only that he made a reputation early in his career by his conduct during the great plague 1584-8, and that, thereafter, he seems to have stood high in the estimation of his professional brethren and of the magistrates of Edinburgh. On the other hand there is a fair amount of information about some of the matters with which he had to deal as an official. If he is, himself, a somewhat shadowy figure, the background against which he played his part is sufficiently clear to give a picture, not without interest, of the development of social medicine in Scotland in his time. . . ."

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*Ritchie, J.: *Medical History*, **4**: 70, 1960.

CARCINOMA IN A THYROGLOSSAL REMNANT*

W. R. GHENT, M.D., C.M., F.R.C.S.[C] and
DOUGLAS WAUGH, M.D., C.M., M.Sc., Ph.D., *Kingston, Ont.*

THE PURPOSE of this paper is to report what appears to be the 13th case of carcinoma arising in thyroglossal tract remnants. The literature on this rare lesion has been reviewed recently by Keeling and Ochsner[1] who found references to five cases and added two of their own. To these should be added the accounts of carcinoma arising in lingual thyroid recorded by Peracchia,[2] Tyler,[3] Marchal *et al.*,[4] Willis,[5] and Canciullo and Motta.[6] Other possible cases have been cited by Wapshaw,[7] but details on these are too scanty to allow evaluation of their exact nature. With so few recorded cases, it is not yet possible to discern any "standard" clinical and pathological picture, or to ascertain the biological behaviour of the lesion.

CASE REPORT

This 41 year old white woman was first seen in May 1959. At this time she complained of nervousness, hoarseness and dysphagia. In addition, she had noted a small lump in her neck in March 1959. On examination at this time, a small mobile mass could be palpated in the midline just below the thyroid cartilage. This moved with swallowing and with tongue protrusion. The lymph nodes in the neck were not enlarged. Laboratory studies revealed a serum cholesterol level of 249 mg. %, hæmoglobin 13.3 g. %, a blood leucocyte count of 6750/c. mm. with a normal differential count. Urinalysis demonstrated a specific gravity ranging from 1.010 to 1.025 with no abnormalities. A barium meal and chest radiograph were reported as negative. Bronchoscopy and œsophagoscopy failed to reveal any abnormalities in these areas.

On June 4, 1959, the cervical mass was exposed using a transverse skin crease incision, and the mass including the remnants of the thyroglossal tract were removed in toto. In addition, the pyramidal lobe of the thyroid gland was excised.

On frozen section at this time a tentative diagnosis of malignancy was made, and a careful search was made in the area for evidence of metastases. No enlarged nodes were found, and the thyroid itself was grossly free of tumour.

Pathological Findings

The excised tissue included the nodule, a portion of the pyramidal lobe and isthmus of the thyroid, and tissue from the thyroglossal tract. The nodule consisted of a bisected, irregular ovoid of firm, homogeneously yellow-white tissue on the external surface of which there were stringy fibrous tags. The halves of the nodule measured 1.2 cm. x 0.3 cm. x 0.5 cm. and 1.0 cm. x 0.3 cm. x 0.1 cm. respectively. Microscopic examination of this tissue revealed a relatively dense collagenous stroma, in one-third of which there were thyroid follicles containing colloid and lined by regular cuboidal epithelium. The remainder of the nodule consisted of small rounded or irregular aggregations of cuboidal or polyhedral cells closely resembling those of normal thyroid epithelium. In several of these alveolar

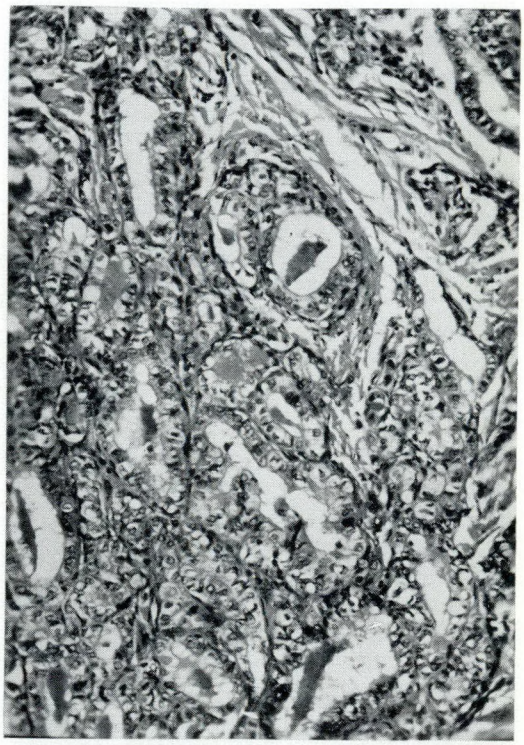

Fig. 1.—Portion of tumour nodule. The neoplastic follicles are irregular and lined by pleomorphic epithelium. Colloid occupies some of the lumina. Hemalum phloxin and saffron stain (x 123).

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clusters, there was a small central mass of eosinophilic colloid (Fig. 1). In sections stained by Verhoef's method for elastica, penetration of vessels by tumour tissue was convincingly demonstrated (Fig. 2).

Microscopic sections of the thyroid isthmus and pyramidal lobe showed normal thyroid structure and no evidence of tumour. Sections of the thyroglossal tract showed it to consist of a strand of connective tissue in which were isolated small nodules composed of thyroid follicles of regular morphology (Fig. 3). Three small lymph nodes were also present and were free of tumour.

The only neoplastic tissue found in the excised material consisted of the small fragment of well differentiated adenocarcinoma in the nodule that was clinically palpable. This was attached by a fibrous strand at one end to the thyroid isthmus and at the other end to the thyroglossal tract. The tumour was about 1.5 cm. above the apex of the pyramidal lobe of the thyroid.

Discussion

The diagnosis of carcinoma in a thyroglossal remnant in this case appears convincing. There was no detectable tumour in the thyroid proper, and in any event a midline suprathyroid route of metastasis would be most unusual. As with most neoplastic rarities, it is difficult to determine the factors of prognostic importance in this case. Up to the time of writing, (eight months after operation) there has been no evidence of local recurrence, and it is our tentative conclusion that the prognosis here is probably the rather favourable one that is usually accorded well differentiated carcinomas arising in the thyroid itself. The rarity with which persistent thyroglossal remnants undergo neoplastic change suggests that while tumours may occasionally arise in heterotopic tissue, this must be excessively rare in the case of this particular anomaly.

Of the six reported cases of carcinoma arising in lingual thyroid, it is noteworthy that five[2-6] were in men and one[8] was in a woman, all adults and of "middle age".[7]

Of the seven tumours arising in the thyroid tract proper, five were in women and two in men. Two of these tumours occurred in children.[1]

Fig. 2.—Tumour in the lumen of a vein. Outline of the vein wall is indicated by black elastica. An irregular mass of neoplastic epithelium fills the lumen. Verhoeff's elastic stain (x 123).

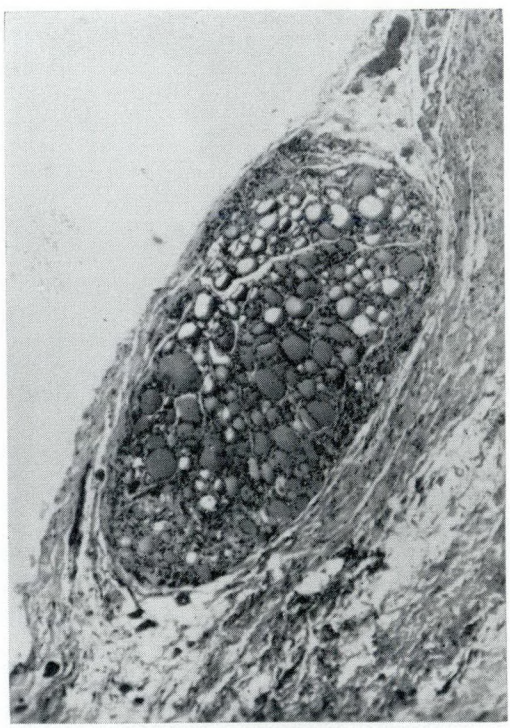

Fig. 3.—Nodule of normal thyroid in the connective tissue of the thyroglossal tract. Hemalum phloxin and saffron stain (x 47).

It is to be hoped that further examples of this rare condition will be reported and that from them more may be learned of the natural history of heterotopic thyroid carcinoma.

Summary

The 13th case of carcinoma arising in thyroglossal remnants has been described. The tumour consisted of a small midline suprathyroid nodule in a 41 year old woman. The good differentiation of the neoplasm and lack of extension other than by vascular invasion are suggestive of a favourable prognosis.

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Résumé

Cette étude a pour but de présenter le treizième cas de cancer reconnu à partir d'un vestige de canal thyréoglosse.

Il s'agit d'une femme de 41 ans qui, vue la première fois en mai 1959, se plaignait de nervosité, de voix rauque et de dysphagie et qui présentait une petite tuméfaction cervicale depuis mars 1959. Objectivement, on pouvait palper sous le cartilage thyroïde une petite masse mobile qui était entraînée avec la déglutition et la protusion de la langue. Tout autre examen complémentaire se révéla négatif.

L'opération consista en l'exérèse complète de la masse avec inclusion du lobe pyramidal. Une coupe par congélation per-opératoire étant suggestive de malignité, déclencha un examen minutieux régional qui s'avéra négatif tant du côté ganglionnaire que thyroïdien.

A l'examen macroscopique, le nodule qui avait un aspect ovoïde irrégulier, montrait une surface de section blanc-jaunâtre homogène traversée de cordes fibreuses.

Au microscope, la coupe montrait du collagène relativement dense avec des follicules thyroïdiens à contenu colloïde et tapissés d'un épithélium cuboïde d'une part, alors que le reste montrait des aggrégations irrégulières ou arrondies de cellules cubiques ou poly-hédriques ressemblant étroitement à un épithélium thyroïdien normal d'autre part.

Plusieurs de ces amas alvéolaires montraient une masse centrale de colloïde éosinophile (Fig. 1). Sur des coupes préparées par la méthode de Verhoef pour montrer la limitante élastique interne, l'envahissement des vaisseaux était clairement démontré (Fig. 2).

Les coupes du lobe pyramidal et de l'isthme thyroïdien, celles du canal thyréoglosse, de même que celles de trois ganglions lymphatiques étaient sans particularité.

Le seul tissu néoplasique, en l'occurence un épithélioma folliculaire bien différencié, était contenu dans le nodule cliniquement palpable qui était localisé entre l'isthme thyroïdien et le canal thyréoglosse.

Des sept cas publies par Keeling et Ochsner, il semble que cette lésion favorise la femme dans la quarantaine et ce cas-ci diffère seulement dans sa classification pathologique puisque cinq des cas publiés étaient des épithélioma papillaires.

PROSTHETIC PRINCIPLES – ABOVE KNEE AMPUTATIONS. Miles H. Anderson, Director, Prosthetics Education Project, School of Medicine, University of California; John J. Bray, Associate Research Prosthetist, School of Medicine, University of California, and Charles A. Hennessy, Associate Director, Prosthetics Education Project, School of Medicine, University of California. 331 pp. Illust. Charles C Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1960. $11.00.

This is a worthwhile book of practical value for prosthetists and limb-fitting surgeons. The background knowledge on which the volume is based is from the "Prosthetics Education Project" of the University of California. This project has accomplished a great deal in furthering the knowledge of gait and mechanics in above knee amputees. The information obtained has been recorded in accurate detail, and records step by step procedure in fitting and making the various above knee prostheses.

It is unlikely this volume would hold much interest for most surgeons, but it would be well worthwhile for all prosthetists and the occasional surgeon dealing with large numbers of amputees.

MYCOTIC ARTERIAL ANEURYSMS

W. J. SIWAK, M.D., and J. C. LUKE, M.D., F.R.C.S.,* *Montreal*

THE DIAGNOSIS and treatment of arterial aneurysms has received recent prominence in the surgical literature due to the marked advances in management. Arteriosclerotic aneurysms comprise the great majority, traumatic types appear to be increasing, while the syphilitic varieties are becoming extremely rare in this country. Mycotic arterial aneurysms are seldom diagnosed before complications occur and are rarely considered as a type of aneurysmal disease. This point is understandable as this variety is uncommon, as illustrated in our experience at the Royal Victoria Hospital, Montreal where, to date, we have repaired or excised and grafted 58 aneurysms of all types. Fifty-six were arteriosclerotic, one probably syphilitic and one mycotic. A discussion of this case and a review of the associated literature on this subject forms the basis of this report.

ÆTIOLOGY

The infective basis of mycotic aneurysms was first recognized by Goodhart[12] in 1877 when he pointed out the relationship of these aneurysms to endocarditis. He states "the clot detached from such a focus will poison the part in which it is lodged and lead to acute softening of the arterial wall by inoculating it with its own inflammatory nature." In 1887 Eppinger[7] was able to demonstrate the same bacterial organisms in the wall of the aneurysm as were present in the cardiac valvular vegetations. This has been subsequently corroborated by others,[3, 19] although in most instances it is difficult to obtain a positive culture from the arterial wall.

Infectious origins other than subacute bacterial endocarditis are rare though reports of foci in bones and lung appeared in the pre-antibiotic era. For instance, in 1923 Stengel and Wolferth[27] reported 187 out of their 217 collected cases of mycotic aneurysms as occuring in association with endocardial disease, the remaining 30 with a variety of other infections. Rheumatic fever is the most common ætiological factor in the development of the endocarditis and in the series of Shnider and Cotsonas,[26] of 42 patients with mycotic aneurysms, 36 had endocarditis subsequent to rheumatic heart disease.

The organism most frequently recovered from the blood stream, the heart valves or the aneurysm is the streptococcus. Table I shows in descending order the relative frequencies of the different bacteria involved.

PATHOGENESIS

Infection of the arterial wall takes place by one or more of the following mechanisms: (1) Direct spread of bacteria from adjacent septic lesions. (2) Lodgement of infected emboli in the lumen of the artery (Eppinger[7]), or the vasa vasorum (de Takats[6]). (3) Settling of the bacteria on the intimal surface. (4) Continuity or contiguity of infection from the cardiac valves.

The acute or subacute arteritis that follows invasion by bacteria results in swelling, ischæmia, splitting and fragmentation of the elastic tissue. Weakening with dilatation of the arterial wall is then inevitable. Once the initial dilatation has taken place the course is steadily progressive. Violent physical exertion or emotional stress are frequently factors precipitating rupture of the aneurysm.[14]

The "incubation period" of mycotic aneurysms will depend on the severity of the infection, virulence of the organism, host resistance and treatment. The location of the reported mycotic aneurysms is shown in Table II.

Since subacute bacterial endocarditis involves the left heart in the great majority of cases,[3, 12, 26] it follows that mycotic aneurysms occur, for the most part, in the systemic arterial tree. The pulmonary arterial circulation may become the site in those infrequent cases of right sided endocarditis or when there is an abnormal communication between the two circulations

*From the Surgical Service of the Royal Victoria Hospital, Montreal.

TABLE I.—Bacterial Organisms Associated with Mycotic Aneurysms

Stengel and Wolferth[27]*—1923*	*Shnider and Cotsonas*[26]*—1954*	*Anderson*[1]*—1957*
Streptococcus (chiefly non hæmolytic)	Streptococcus viridans	Streptococcus
Staphylococcus	Streptococcus salvarius	Pneumococcus
Pneumococcus	Streptococcus hæmolyticus	Gonococcus
Influenza bacillus	Staphylococcus	Influenza bacillus
Gonococcus		Typhoid bacillus
		Others

as in the case of a patent ductus arteriosus. Arterial emboli from the valve vegetations may be of sufficient size to occlude relatively major arteries and occur frequently in association with mycotic aneurysms.

Most aneurysms are small, varying in size from that of a millet seed to that of a pea. Vessels of all sizes are involved from the smallest unnamed arteries to that of the aorta. Only occasionally will the aneurysm size exceed a diameter of 2 cm. to 3 cm. with the exception of the false aneurysm produced by rupture. Vegetations similar to those of the heart valves may be present about the edges of a mycotic aneurysm or in its depth.

Histologically there is loss of intima and destruction of elastic tissue, including the internal elastic lamina, acute or subacute periarteritis and mesarteritis. Polymorphonuclear leucocytes are abundant with masses of bacteria. In the more acute aneurysms, there is marked infiltration with polymorphonuclear cells and microscopic abscesses are not uncommon.

TABLE II.—Distribution and Incidence of Vessel Involvement in Mycotic Aneurysms

	Stengel and Wolferth	*Shnider and Cotsonas*
Aorta	66	5*
Innominate	2	
Vertebral	1	
Basilar	4	3
External carotid		1
Internal carotid	3	
Cerebral	34 (middle cerebral 14)	13 (middle cerebral 3)
Subclavian	1	
Axillary	3	1
Brachial	10	1
Radial	5	
Ulnar	5	3
Iliac	10	5
Gluteal	3	3
Femoral	16	6
Profunda femoris	2	
Popliteal	5	4
Posterial tibial	8	5
Coronary	9	
Superior mesenteric and branches	24	14
Splenic and branches	15	
Hepatic and branches	19	2
Renal and branches	5	
Pulmonary and branches	14	3
	264	69

*Excludes proximal aortic arch.

Clinical Considerations

A study of the reported cases and our own experience reveals that mycotic aneurysms have certain rather characteristic features which aid in distinguishing them from other varieties.

1. They occur in the course of a bacteræmia, usually associated with bacterial endocarditis.

2. They are frequently multiple. Approximately one out of every four cases reported by Stengel and Wolferth[27] had more than one aneurysm.

3. The peak age incidence is in the third decade. In a report of 62 cases by Shnider and Cotsonas,[26] the youngest patient was eight years and the oldest 50 years of age.

4. Mycotic aneurysms are commoner in men in a ratio of 3:1, despite the fact that rheumatic mitral disease is twice as common in women.[24]

5. Pain precedes their appearance, being intense and at times difficult to localize.

6. Rupture occurs frequently before the aneurysm reaches any appreciable size. In an extremity this produces a false sac usually with self-limited bleeding in contradistinction to the free exsanguinating hæmorrhages of intraabdominal and intrathoracic types.

7. These aneurysms commonly occur at bifurcations.

8. The proximal aorta is a favourite site for mycotic aneurysms, but the abdominal aorta is infrequently involved. Only seven cases could be found in the literature of abdominal aortic involvement.[20, 29] The superior mesenteric artery is much more frequently involved than any other major

branch artery. One such aneurysm has been resected by DeBakey and Cooley[5] but the majority are found at autopsy because of diagnostic difficulties.

Shnider and Cotsonas[26] have described four clinical syndromes by which ruptured mycotic aneurysms may reveal themselves.

1. Intracranial syndrome: These patients develop a subarachnoid hæmorrhage, hemiparesis or hemiplegia and coma. Increasing headache is commonly a preceding symptom.

2. Abdominal syndrome: Abdominal pain and collapse with a shock-like state and signs of intraabdominal or extraperitoneal hæmorrhage in a patient with or following subacute bacterial endocarditis, should indicate this possibility. A pulsating mass with a bruit rarely occurs.

3. Thoracic syndrome: Severe chest pain, hæmoptysis and shock indicates the possibility of rupture. Hæmothorax may be present but relatively sudden death is the rule.

4. Extremity syndrome: Rupture of an aneurysm in an extremity is usually contained by the surrounding tissues with the development of a false sac. The sudden development of a pulsating mass is strongly suggestive of this lesion. An associated bruit is continuously heard. The rupture is accompanied usually by severe continuous pain due to local tension and nerve compression.

As a mycotic aneurysm projects from one aspect of the wall, the flow in the artery is seldom interfered with unless the pressure of the false sac is such as to occlude the distal flow. Therefore, thrombosis in the false sac rarely involves the parent artery with the result that gangrene subsequent to thrombosis or rupture of this type of aneurysm is much less common than it is in the arteriosclerotic variety where the aneurysm is in the form of a fusiform involvement of the affected artery.

Radiography and arteriography are valuable diagnostic aids. Large densities in the chest may be visualized on plain films but arteriography is necessary to accurately diagnose the intracranial or abdominal types. Clinical examination is usually sufficient for those in the limbs but arteriography adds further detail regarding location and size.

Prognosis

Due to the difficulty or virtual impossibility of diagnosing a mycotic aneurysm prior to rupture the prognosis is grave. In the intracranial types a lesser initial leak may allow the diagnosis to be made by cranial arteriography with a good chance of subsequent surgical cure. As mentioned above, rupture of the extremity type is readily diagnosed and can be treated successfully if found sufficiently early.

Mycotic aneurysms have been reported[27] to undergo spontaneous cure by thrombosis of the aneurysm or the false aneurysm produced by rupture. The incidence of such "cures" is impossible to estimate but may be commoner than is believed because the number of cases of subacute bacterial endocarditis developing clinical evidence of an aneurysm is quite low.

Treatment

Before the use of antibiotics, endocarditis had an extremely high mortality and a mycotic aneurysm only added to the poor outcome. As the prognosis of the underlying disease has improved with antibiotic therapy coincident with the improvement in vascular surgical techniques, the mortality rate in the intracranial types and particularly in the extremity group has shown a marked improvement.

In all aneurysms, excision and restitution of normal blood flow by grafting is the ideal objective. However, inasmuch as the mycotic aneurysm is a lateral variety (even when ruptured with a false sac), the surgical problem is somewhat different from that of the usual arteriosclerotic type. The need for resection and grafting of any appreciable length of the parent artery rarely arises because the originating artery seldom shows complete occlusion.

The main vessel proximal to the aneurysm should initially be cleared and controlled by a clamp. The false sac is opened as dissection of this sac is not possible due to the fact that it is composed only of thickened surrounding tissues. Through the opened sac the mouth of the aneurysm in the host artery can be closed by

TABLE III.—Reported Cases of Mycotic Aneurysms Treated Successfully by Operation

Year	*Author*	*Site*	*Underlying illness*	*Procedure*	*Result*
1908	Clutton and Dudgeon[4]	Femoral	Pneumococcal pneumonia	Proximal ligation	Satisfactory
1909	Lewis and Schrager[18]	Brachial	Subacute bacterial endocarditis	Proximal ligation	"
1934	Gage[9]	Common iliac	"	Sympathectomy proximal ligation	"
1946	Klein and Crowell[17]	Ulnar	"	Excision	"
1948	Hurwitz and Arst[15]	Brachial	"	Excision	"
1948	Julian[16]	Common femoral	"	Excision	"
1949	Goadby *et al*[11]	Femoral	"	Proximal ligation	"
1951	Rogers[25]	Femoral	"	Sympathectomy ligation and division of external iliacs: aneurysmorrhaphy	Good
1952	Fernbach *et al*[8]	Common iliac	"	Ligation	"
1953	DeBakey and Cooley[5]	Superior mesenteric	"	Resection: simultaneous ligation of mesenteric vein	"
1953	Harrison and Desmond[13]	Popliteal	"	Proximal ligation	"
1953	Tresidder and Warren[28]	Posterior tibial (Bilateral)	"	Excision	"
1954	Barker[2]	Deep femoral (Bilateral)	"	Excision	"
1955	Moore and Telling[21]	Common iliac	"	Resection of aortic bifurcation and graft with preserved arterial graft	"
1956	Rogers[23]	Femoral (bilateral)	"	Hunterian ligation and division of external iliacs	"
1957	Ghabrial and Higazi[10]	Common femoral (bifurcation)	"	Sympathectomy: excision and arteriorrhaphy	"
1960	Siwak and Luke	Popliteal	"	Proximal ligation and obliterative aneurysmorrhaphy	"

interrupted silk sutures. If this procedure is only partly successful in controlling the aneurysm a proximal ligation of the associated main vessel is performed. As in most aneurysms, a large layer of clot lines the false sac and this clot may have extended into the aneurysmal ostium to occlude the parent artery. Usually this clot extension will readily lift out with the aneurysmal layers, but occasionally distal propagating thrombosis will require removal by wire loop or flushing through an opening in the artery distal to the lesion.

Lumbar sympathectomy will occasionally tide over a dubiously viable extremity where proper restoration of blood flow has not been achieved.

Table III summarizes the location, types of procedure and results in the reported series of mycotic aneurysms successfully treated to date.

Case Report

C.B. a 59 year old labourer, was admitted to a neighbouring hospital on October 27, 1959, with a two week history of chills, fever and neck pain. Examination revealed no explanation of his febrile illness and his spinal fluid examination was negative. On November 18 he developed pain in the left knee and the left foot became swollen, red and painful. Subacute bacterial endocarditis was considered but blood culture was negative and his heart sounds were normal.

On November 27, an aortic diastolic murmur was heard for the first time while his diastolic pressure dropped from 80 on admission to 45 mm. Hg. In addition, there were bouts of extrasystoles. He was started on 5,000,000 units of penicillin daily and his fever gradually disappeared. The heart murmur however, became more prominent. Tenderness in the left popliteal fossa developed

along with fulness in the upper calf. The foot pulses were strong and equal.

A blood culture done on December 1, was positive for *strep. viridans* and the penicillin dosage was increased to 10,000,000 units per day. During the latter part of December, pulsations at the left ankle became weaker while pain in the left calf increased to a degree where opiates were necessary. A pulsatile mass appeared in the upper calf and popliteal region which revealed a large dumbbell shaped aneurysm on arteriography. The patient was transferred to the Royal Victoria Hospital on January 8, 1960.

Examination revealed an irregular pulse of 84 per minute, B.P. 110/50 and normal temperature. Cardiac examination revealed an early, high pitched diastolic murmur over the entire precordium, best heard to the left of the sternum. A faint rumbling middiastolic murmur was present confined to the cardiac apex. The left leg showed a large round pulsatile mass about the size of an orange underlying the superior portion of the gastrocnemius muscle and accompanied by a loud bruit. The left dorsalis pedis pulse was faintly palpable and the posterior tibial pulse was absent.

Laboratory examinations revealed a normal urine, Hb. 10 g. %, N.P.N. 28 mg. % and cholesterol 123 mg. %. A blood culture was negative. Further arteriography (Fig. 1) disclosed the large aneurysm and a diagnosis of ruptured mycotic aneurysm with false sac was made.

Operation was performed on January 12, 1960. The thin sac wall was densely adherent to the adjacent muscle and could not be separated. The aneurysm was opened after control of the proximal popliteal artery and retrograde bleeding occurred from an opening deep in the sac which was presumed to be the point of rupture of the previous mycotic aneurysm. This opening was about 1 cm. in length and was closed by interrupted sutures from the aneurysmal side. To be certain of hæmostasis, a ligation of the popliteal artery just proximal to the aneurysm was performed. On opening the aneurysmal sac a large cast of thrombus filling the sac was evacuated. Because the sac wall was impossible to remove, an extensive dead space remained which extended from the flexor compartment

Fig. 1.—Arteriogram revealing the large dumbbell shaped sac of the false aneurysm.

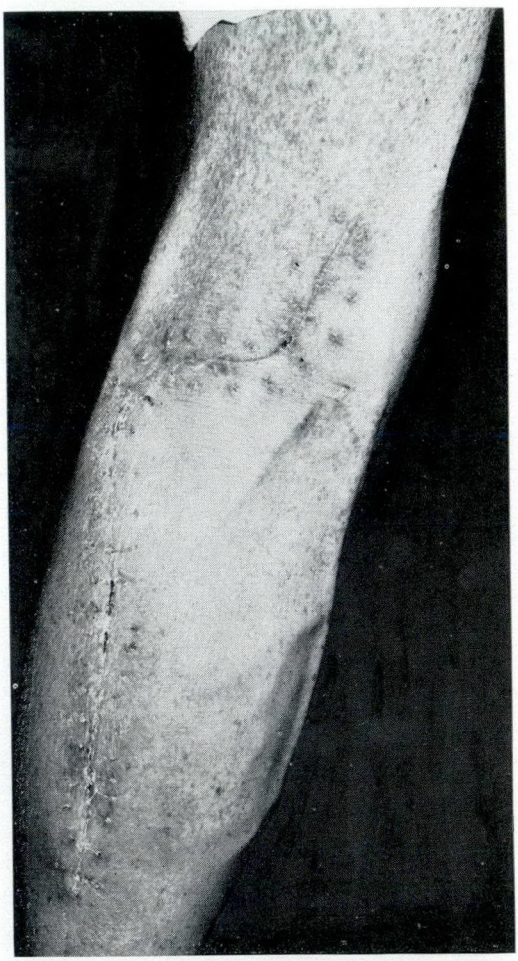

Fig. 2—Ten day postoperative healed incision showing the degree of exposure necessary.

through the interosseus ligament to the anterior space. This was filled by a pedicled muscle flap taken from the soleus muscle and the wound was drained. Following operation, the left foot was cool and dusky but within three days regained normal colour and a faint dorsalis pedis pulse could again be felt. All the patient's previous leg pain had disappeared.

Microscopic report of a section of the wall of the aneurysm reads as follows "the wall of the aneurysm shows hyaline degeneration. The adventitial tissue is thickened by dense fibrosis and focal and chronic inflammatory cell infiltrate. Some fibrosed muscle is attached. The thrombus has layers of old and more recent thrombosis." Further blood cultures on January 22 and 26 were negative. The healed operative incision is shown in Fig. 2.

Since discharge from hospital, the patient has been free from pain. He has claudication in the left foot on walking more than four blocks at a fast pace, but reports progressive improvement in this symptom.

Summary

A case of mycotic aneurysm of the popliteal artery complicating subacute bacterial endocarditis is presented in which successful proximal ligation and modified obliterative endoaneurysmorrhaphy was carried out.

The ætiology, pathogenesis, incidence, diagnosis and treatment are reviewed in the light of our experience and that of the world literature.

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Résumé

Les anévrysmes mycotiques artériels sont exceptionnellement diagnostiqués avant que surviennent les complications, et à cause de leur incidence sont rarement inclus dans la maladie anévrysmale, ce qui est illustré par notre expérience au "Royal Victoria Hospital" où jusqu'à maintenant nous avons réparé ou excisé et greffé 58 anévrysmes, dont 56 étaient artériosclérotiques, un probablement syphilitique et un mycotique.

L'origine infectieuse des anévrysmes mycotiques fut premièrement reconnue par Goodhart[12] en 1877 lorsqu'il fit la relation entre les anévrysmes et l'endocardite. L'organisme le plus souvent en cause est le streptocoque.

Cliniquement, ils surviennent au cours d'une endocardite bactérienne sub-aiguë et sont souvent multiples. Ils donneront, selon leur localisation, un syndrome douloureux prémonitoire du drame.

Le pronostic est toujours grave, mais depuis l'avènement des antibiotiques et l'avancement de la chirurgie vasculaire, le taux de mortalité a diminué en ce qui concerne les localisations intracrânienne et en particulier aux membres.

L'excision associée à la greffe artérielle pour rétablir le flot sanguin donne les meilleurs résultats.

Un cas d'anévrysme mycotique de l'artère poplitée survenu au cours d'une endocardite bactérienne sub-aiguë avec correction chirurgicale est rapporté.

JENNER AND VACCINATION*

"Edward Jenner's great contribution to vaccination against smallpox stands out, perhaps unequalled in the domain of public health and preventive medicine. But both Jenner's work and Jenner's personality were variously judged at the time. It was claimed that vaccination was based on unsound grounds and that Jenner himself was little more than a quack. The idea that an attack of cowpox safegarded the victim against smallpox was said to be prevalent among the dairy hands in Gloucestershire, and Jenner was a Gloucestershire boy. In 1796 Jenner inoculated the skin of a lad, James Phipps, with material from a cowpox vesicle on the hand of a dairymaid, Sarah Nelmes. The vaccination took, and later inoculation of smallpox material failed to produce disease. . . .

"Perhaps it is fairest in appraising the rationale of Jenner's work to stick to his published facts as exposed in the 'Inquiry'. After an introductory paragraph, Jenner turns immediately to discussion of a disease of horses called 'the grease'. 'It is an inflammation and swelling in the heel, from which issues matter possessing properties of a very peculiar kind, which seems capable of generating a disease in the Human Body (after it has undergone the modification which I shall presently speak of) which bears so strong a resemblance to the Small Pox, that I think it highly probable it may be the source of that disease.' Jenner goes on to claim, in brief, that milkers may contaminate cows with material from 'the grease', which produces cowpox, which, in turn, may be transmitted to the milkmaids. 'Thus the disease makes its progress from the Horse to the nipple of the Cow, and from the Cow to the Human Subject . . . but what renders the Cow-Pox virus so extremely singular is, that the person who has been thus affected is forever after secure from the infection of the Small-Pox; neither exposure to the variolous effluvia, nor the insertion of the matter into the skin, producing this distemper.' . . .

"The great fact stands out that Jenner's thesis has turned out to be correct, but was this a lucky guess, as some have claimed, or does his published evidence really justify his conclusions?" . . .

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*Bloomfield, A. L.: Some footnotes to Medical History, *A.M.A. Arch. Int. Med.*, **106:** 293, 1960.

SIGMOIDOSCOPIC APPEARANCE OF COMMON ILIAC ARTERY ANEURYSM

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DURING sigmoidoscopic examination it is not uncommon to see or feel the pulsations of the iliac arteries, but during a recent examination an iliac aneurysm was thus diagnosed. Consultation with colleagues and a search of the literature have failed to reveal any record of a similar finding.

CASE REPORT

W.S., a white man aged 71, was admitted to hospital on October 28, 1959. He complained of colicky central abdominal pain of four days' duration associated with absolute constipation. For three days he had not passed flatus. He had been belching, but had not vomited. He was habitually somewhat constipated. There was no blood in his stools or melæna. He was known to be hypertensive, with his highest recorded blood pressure 222/154.

On examination the patient was obese; his blood pressure was 166/88; his temperature and pulse were normal. The abdomen was somewhat distended, with normal bowel sounds, and an ill defined tender mass below the left costal margin. No other masses or pulsations could be felt in the abdomen. The femoral artery pulsations were normal. Digital rectal examination was negative.

On October 29, 1959, sigmoidoscopic examination was performed with the patient first in the left lateral and then the knee-chest position. *A large pulsatile swelling was seen and felt through the bowel wall on the right side at six inches,* which suggested the diagnosis of an aneurysm of the right iliac artery and warranted caution in the examination. Spasm of the rectosigmoid junction prevented examination beyond seven inches, but no other findings were noted.

On October 30, 1959, a flat plate of the abdomen showed no abnormalities, and a barium enema revealed diverticulosis of the sigmoid colon. Hæmoglobin was 13.1 g. % but on November 1, 1959, the white cell count was 20,600 per cu. mm.

At 10.30 p.m. on November 1, 1959, the patient complained of sudden excruciating pain in the left lower quadrant of the abdomen, and promptly became extremely shocked, pulseless and perspired profusely. In spite of resuscitative measures he died 40 minutes later.

At postmortem examination there was an extensive left sided retroperitoneal hæmatoma and about 500 c.c. of free bloodstained fluid in the peritoneal cavity. The abdominal aorta from the renal arteries downwards, was hard and dilated to 10 cm. diameter. On the left postero-lateral wall of this aortic aneurysm there was a penetrating tear 3 cm. long. Both common iliac arteries were dilated to 4 cm. diameter to a point 8 cm. distal to the aortic bifurcation (Fig. 1). There was an old mural thrombus of the aortic wall, and a recanalized central thrombus of both common iliac arteries. The descending branch of the left coronary artery was half occluded by an atheromatous plaque. There were numerous diverticula of the sigmoid colon.

DISCUSSION

In view of the patient's obesity, the

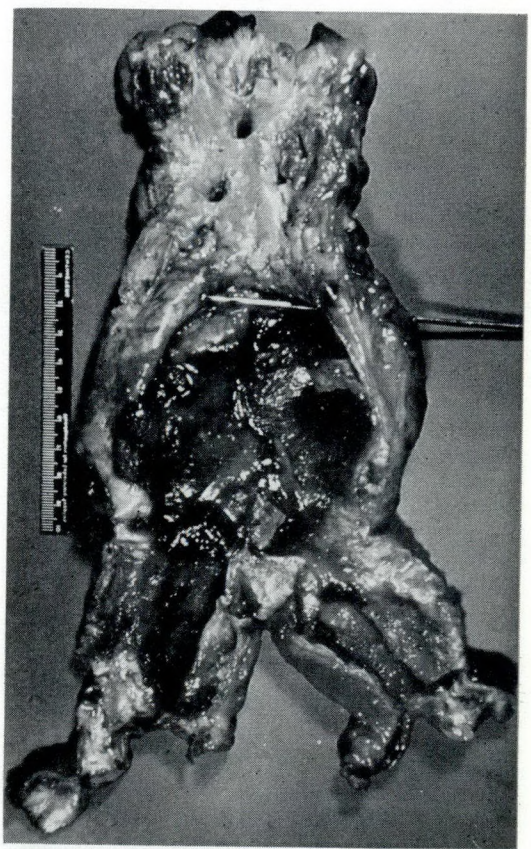

Fig. 1.—Ruptured aortic aneurysm with probe through ruptured portion on left side and aneurysms of both common iliac arteries.

abdominal aneurysm could not be felt through the anterior abdominal wall. The diagnosis of iliac aneurysm was made as a result of the sigmoidoscopic examination. Prompt recognition of such an aneurysm is important to prevent rupture of the aneurysm during the examination.

SUMMARY

A case is described in which a right common iliac aneurysm was diagnosed at sigmoidoscopic examination and later confirmed by postmortem examination, when a ruptured abdominal aortic aneurysm was found.

ACKNOWLEDGMENTS

We wish to thank Dr. W. W. Ridge for referring this case; the pathology department of St. Joseph's Hospital, Hamilton, for the postmortem report and photograph; and Miss J. Ashley for preparation of the colour photograph for monochrome reproduction.

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RÉSUMÉ

Un cas est rapporté donc l'examen sigmoidoscopique a présenté un aneurisme de l'artère moyenne iliaque. On ne peut pas palper l'aneurisme dans l'examen de l'abdomen parce que le malade était trop gros. Le diagnose était confirmé après trois jours quand le malade est mourit à cause d'un rupture d'un aneurisme aortique abdominal.

ARTIFICERS OF THE GOLDEN BOWL*

". . . By the time of (Horsley's) death, Harvey Cushing in America had established himself as the pioneer of neurosurgery in that country. His genius and his contribution were of a different kind, and in historical orientation he will probably be regarded as the cartographer of this new world into which Horsley had sailed, and as the one who brought its treasures from the prerogative of genius and placed them in the safe keeping of lesser men.

"A graduate of Yale, Cushing had received his first stimulus from Jack Elliott, of the Massachusetts General Hospital, when he was an intern. In 1895, Jack Elliott, acting under the stimulus of Horsley, essayed the first operations on the brain in the United States of America. These had proved rapidly fatal. Cushing had been very interested in these cases, and characteristically had made notes on them. Elliott suggested to him that they should be reported; but Cushing refused to cooperate, feeling that this dismal story would be poor publicity for a branch of surgery to which he had already felt the call.

"From earliest years, Cushing had chosen paths leading to success. An early comment made by Professor Newell, at one time a fellow resident, hints at his consecration to success:

'He was recognized as the ablest man of his class, and an extremely hard worker. As a house officer, I was his junior and suffered severely in that position for a year. He was an extremely hard man to work with, whether one was over him or under him, as his tremendous ambition for success made it impossible for him to allow anyone else to get credit for work done. As you know when he wanted to be, he was one of the most charming people in the world, but working with him I found he couldn't tolerate anyone else in the limelight.' . . ."

*MILLER, D.: *M. J. Australia*, **2**: 5, 1960.

NEONATAL RUPTURE OF THE STOMACH DUE TO CONGENITAL MUSCLE DEFECT*

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H. F. OWEN, M.D., C.M., F.R.C.S.[C],‡ *Montreal*

Introduction

Perforation of the stomach in the neonatal period is rare. Publications dealing with this condition have appeared infrequently in recent years and these have indicated that too often the condition is not recognized until postmortem studies have been made. Failure to consider the possible existence of this disorder often leads to delay in diagnosis which has contributed markedly to the very high mortality. If these unfortunate babies are to have any chance of survival, early diagnosis and early operation are mandatory.

Siebold[14] was the first to report on gastric perforation in a newborn infant in 1825. Since then over 70 cases have been reported in the literature. The first attempt at surgical repair of a perforation of the stomach in a newborn infant was described by Stern[17] in 1929. The first newborn infant to survive operation was reported by Legar[8] in 1950, although in 1932 Selinger[13] had successfully repaired a gastric perforation in a three month old baby.

Only one case of spontaneous gastric perforation in a newborn infant is on record at The Montreal Children's Hospital. Features of the case are so typical of the majority of those in the literature that its presentation seems worthwhile.

Case Report

The patient was born on August 26, 1958. The mother had had one previous normal pregnancy. On this occasion she was delivered one week before term, the delivery being spontaneous and uneventful.

The baby was an apparently normal boy weighing 7 lb. 3 oz. (3260 g.). He took his early feedings well and meconium was passed spontaneously. On August 29, his temperature was 100.3° F. but dropped to 98.4° F. in the evening, and on August 30 it remained at 99.2° F. throughout the day. That same evening after a feeding, he vomited some bile stained fluid. He appeared pale and slightly cyanotic and his respiratory rate was rapid. There was no abdominal distension and the bowel sounds were normal. He took other feedings normally during the night.

On the morning of August 31, his fifth day of life, considerable deterioration in his condition was observed. Along with respiratory distress he now had marked abdominal distension and no bowel sounds were audible. At this stage he was transferred to The Montreal Children's Hopsital.

On admission, physical examination revealed a lethargic infant with mottled cyanosis, most pronounced in the extremities, and severe abdominal distension. The temperature was 100.6° F. and the pulse rate was 160 per minute and regular. Although the respirations were rapid and irregular, the chest was clear to auscultation. The abdomen was tympanitic. No masses were palpable although the baby resented abdominal palpation.

Radiological examination demonstrated no abnormality in the chest, but revealed a considerable amount of free air in the peritoneal cavity and very little air in the gastrointestinal tract (Figs. 1a and 1b).

Continuous nasogastric suction and intravenous infusions were started. Antibiotics and vitamin K were given. The infant was taken to the operating room two hours after admission to hospital.

At operation, air escaped as the peritoneal cavity was entered. A large quantity of yellow bile stained fluid was aspirated. On general inspection no gross lesion was visible. More searching examination indicated that the fluid was oozing from the foramen of Winslow. The gastrocolic omentum was divided, the lesser sac entered, and a perforation was found high on the posterior wall of the stomach towards its greater curvature. This opening appeared to be 4 cm. to 5 cm. in length. It was closed by means of a single layer of interrupted and inverted mattress sutures of fine black silk. The abdominal incision was closed in layers and a small Penrose drain was left in the lesser sac.

The baby's condition gradually deteriorated and he died 12 hours postoperatively.

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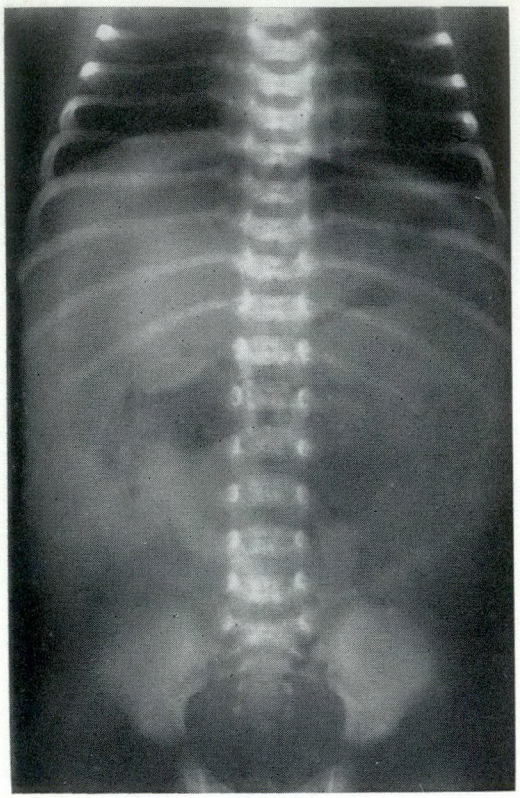

Fig. 1a.

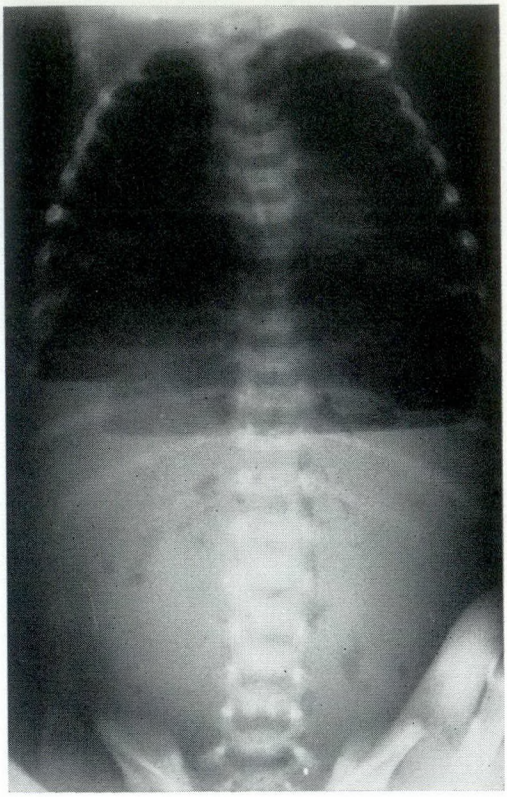

Fig. 1b.

Figs. 1a and b.—Radiographs taken with patient in (a) supine and (b) upright positions show the presence of free air in the peritoneal cavity.

An autopsy was performed and apart from the presence of a purulent peritonitis, the main findings of interest were noted on examination of the stomach. There was no leakage from the suture line in the stomach wall. After fixation of the stomach the sutures were removed and the tear and stomach wall examined thoroughly. The actual tear measured 2 cm. in length and adjacent to this there was an area of marked thinning of the stomach wall which measured 2.5 cm. in length and 1.2 cm. in width. The thin area transilluminated brightly.

Histologic examination revealed marked hypoplasia of the muscular coat of the stomach along the greater curvature (Figs. 2a and 2b, and 3a and 3b).

As an incidental finding, there was atresia of the proximal segment of the left ureter with a multicystic left kidney showing only a minimal amount of renal parenchyma.

Pathogenesis

Many ætiological factors have been shown to produce rupture of the stomach in the newborn infant, but our primary interest was in those cases which have shown a muscular defect in the stomach wall. Approximately 15 such cases have been reported.[1, 5, 6, 9-12, 19]

Acute or chronic peptic ulceration was the presumed cause of all gastric perforations in the newborn until 1943 when Herbut[6] demonstrated the presence of a muscle deficiency in the stomach wall, which he postulated to be the result of failure of fusion of the anlage of the circular muscle layers. While peptic ulcer is usually the cause of duodenal perforation in infants, it appears to account for less than half of the cases of gastric perforation. The ulcer that has been observed to accompany intracranial lesions has also been blamed for gastric perforation in infants,[3] but in most cases reported, no intracranial lesion has been present.

Septicæmia with gastric ulceration and necrosis of the stomach wall has resulted

in rupture of the stomach.[19] Some cases have been associated with distal obstruction in the gastrointestinal tract[7, 15] but not all of these have been associated with muscle deficiency in the stomach wall. Trauma to the abdomen[4] during delivery has been postulated as a cause but as yet is unproven. There is no air in the gastrointestinal tract until after birth and it would be a really traumatic delivery that ruptured a small non distended stomach. Perforation of the stomach by nasogastric tubes that were being used for aspiration or gavage feeding has also been reported.[19-21]

Perforation of gastric diverticula[2, 16] in the newborn period, with and without distal obstruction, have been reported. These cases can most likely be grouped with those showing congenital muscle defects since they exhibited a type of muscle inadequacy and were in the same location high on the greater curvature of the stomach.

Discussion

Gastric perforation in the newborn infant is an acute surgical emergency which requires prompt treatment. The clinical picture is remarkably constant and the case presented here is typical. The baby is usually well for the first few days of life. In the majority the sudden catastrophe occurs within the first week. Associated anomalies are often present and these may or may not contribute to the perforation. In our case there was an anomaly of the left ureter and kidney which obviously did not contribute to the rupture of the stomach.

When rupture occurs there may be a fairly rapid onset of abdominal distension with associated paralytic ileus, or, as in our case, this may be preceded by respiratory distress. It is suggested that the cause of this distress is irritation of the diaphragm, producing shallow, rapid, irregular breathing and poor air exchange in the lungs leading to the dyspnœa and cyanosis. This may well be a clue to diagnosis in the early stages. Radiological examination with the patient in the upright position will show free air in the peritoneal cavity indicating rupture of a hollow viscus and making laparotomy mandatory.

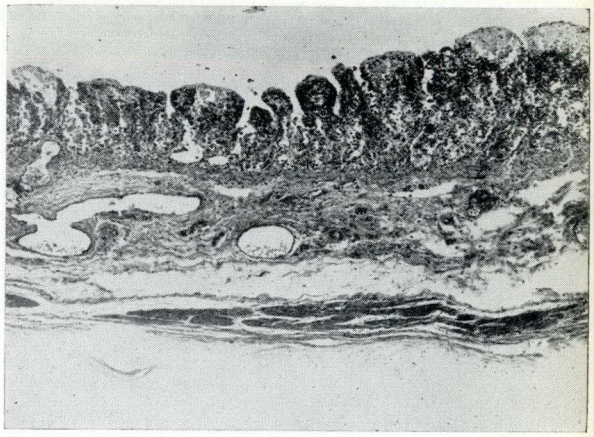

Fig. 2a.

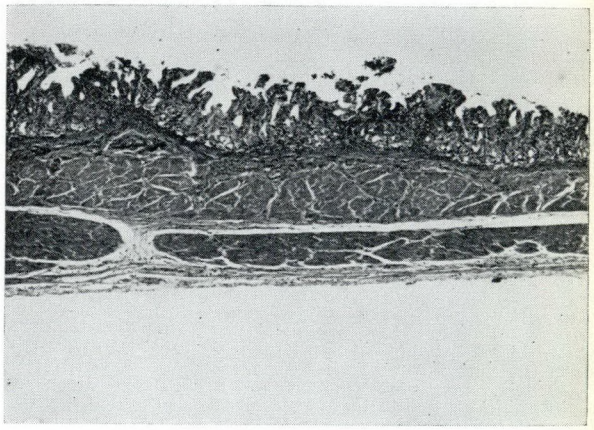

Fig. 2b.

Fig. 2a and b.—Photomicrographs of stomach wall (original magnification x 52). (a) From the case reported showing the markedly hypoplastic muscle layer and wide submucosa containing large vessels. (b) Normal stomach in the newborn infant, for comparison of thickness of muscle layer.

Pneumoperitoneum in the infant who continues to thrive has been treated conservatively,[18] but infants with gastric perforation are usually seriously ill and it is completely unjustified to delay operation no matter how tempting it may be to consider conservative treatment. Where there is a muscle defect, the tear in the stomach wall may be 1 cm. to 6 cm. in length and it is asking too much to expect it to seal spontaneously. Immediate surgical closure offers the only chance for survival. Abdominal paracentesis might help to relieve the respiratory distress but should not be allowed to delay operation.

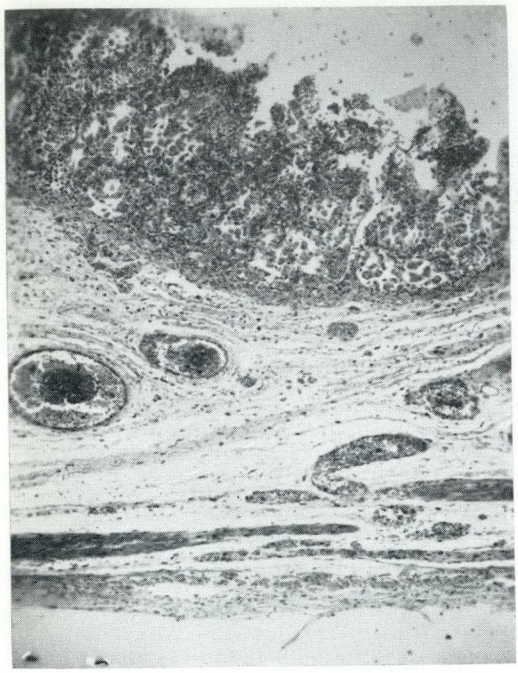

Fig. 3a.

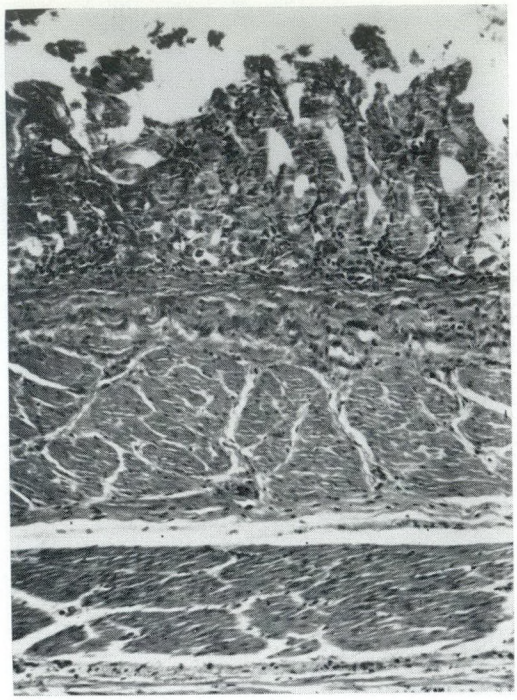

Fig. 3b.

Figs. 3a and b.—Photomicrographs of stomach wall (original magnification x 85). (a) From case reported. (b) From normal newborn infant's stomach. The higher magnification further stresses the pronounced lack of musculature in (a).

When closure is performed, the tear should be debrided and care taken to place sutures through healthy stomach wall. The debrided material will provide tissue for histological examination. Some of the reported surviving patients had no tissue submitted to the pathologist and, therefore, without casting any doubt on the clinical acumen of these authors, their diagnosis of congenital muscle defect must remain presumptive.[1, 10, 12]

The presence of the lesion high on the greater curvature is supposedly pathognomonic of congenital muscle defect but this is not necessarily true. Lesions in this location are not always associated with congenital deficiency in the musculature, and further, perforations in this location have occurred from other causes. Congenital muscle deficiency, however, is probably responsible for the vast majority of tears of the stomach wall high on the greater curvature and may well have been present in many cases previously attributed to peptic ulceration.

The results of operation can be improved. To date, the diagnosis of gastric perforation in the newborn has been made most often at postmortem examination. This however will change. Of the infants subjected to operation, the survival rate is approximately 30%. The chief cause of death is overwhelming peritonitis. Occasionally the associated anomalies play a part in the death of the infant. At the time of operation one must look for distal obstruction in the gastrointestinal tract. Successful treatment demands a suspicious mind, an early diagnosis and prompt surgical repair, if the peritonitis is to be controlled.

Summary

A case of spontaneous perforation of the stomach in a newborn infant is presented. The ætiology of the perforation is a congenital muscle deficiency in the stomach wall.

Perforation of the stomach in newborn infants is reviewed in general and that due to congenital muscle defects in particular.

Delay in diagnosis is the major factor at present responsible for the high mortality.

This is an acute surgical emergency in the newborn period and requires prompt surgical intervention if these patients are to have any chance of survival.

ACKNOWLEDGMENT

The authors extend their thanks to Dr. Ilona Kerner, Assistant Pathologist of The Montreal Children's Hospital, for her assistance in the preparation of the pathological sections and the photomicrographs.

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RÉSUMÉ

La perforation gastrique chez le nouveau-né est rare. La première publication à ce sujet date de 1825 et est due à Siebold.[14] Depuis on en retrouve 70 dans la littérature. La première tentative de correction chirurgicale a été décrite par Stern[17] en 1929, tandis que la première survie est due à Legar en 1950. Le seul cas survenu au "Montreal Children's Hospital" est rapporté.

L'étiologie de la perforation était une déficience musculaire congénitale de la paroi gastrique postérieure haute du côté de la grande courbure. Le tableau clinique est assez constant et typique en ce que le calme des premiers jours de vie est soudainement brisé par le drame abdominal qui accompagne habituellement la perforation d'un organe creux qui se complique précocement de péritonite. La suture immédiate offre l'unique chance de survie.

AN INTERESTING COMPLICATION OF JEJUNO-ILEAL DIVERTICULITIS

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Diverticula of the small bowel, exclusive of Meckel's diverticulum, are rare. They are usually encountered unexpectedly at operation or autopsy. Occasionally they are detected on barium examination of the upper gastrointestinal tract.

Incidence and Occurrence

They appear to occur more commonly in men, particularly in the 50 to 70 year age group. Edwards[3] found nine cases in 2820 autopsies, an incidence of 0.31%. This is probably closer to the true incidence than the estimates based on various reports of the occurrence of this lesion in radiological series. Shutkin,[1] Mahorner[2] and Ratcliffe[7] in their reports have discussed the incidence in detail and their observations need not be elaborated upon here, other than to say that these are the rarest of gastrointestinal tract diverticula. Diverticula of the gastrointestinal tract occur in the following sites in order of decreasing frequency: colon, ileum (Meckel's), duodenum, pharynx and œsophagus, stomach, and jejunum and ileum. Benson[6] mentions that they are frequently accompanied by congenital anomalies.

Pathology

Jejunal and ileal diverticula are of the pulsion type and are located along the mesenteric attachment. They are said to occur at sites where blood vessels perforate the bowel wall. The wall of such diverticula is made up of mucous membrane only, but there may be some stretched-out muscle fibres around the base. Edwards[3] has given a detailed description of their pathogenesis. The number and size of diverticula decrease distally in the small bowel from the ligament of Treitz to the ileocæcal valve. They may be large or small and may vary in number from a single diverticulum to several hundred.

Surgical Aspects

The surgeon becomes interested in this problem either because he encounters it at laparotomy or in his endeavours to treat complications resulting from the presence of diverticula. If these are found incidentally at laparotomy, most surgeons agree that they require no specific treatment. We feel that this is sound advice, firstly because they are predominantly asymptomatic and secondly because the excision of the involved bowel would have to be extensive, resulting in small bowel insufficiency. Pain, due to distension of the diverticulum, borborygmus, flatulence and vomiting have been attributed to their presence. A few cases in the literature would seem to substantiate this claim but the great majority appear to be asymptomatic. Complications of diverticulosis of the jejunum and ileum require more aggressive treatment.

The following complications have been encountered in our review of the available literature:[10, 11] acute or chronic mechanical intestinal obstruction, hæmorrhage,[5] inflammation,[4, 7] free perforation into the mesentery, pneumoperitoneum,[8] foreign bodies,[9] and carcinoma.[6] (A detailed classification of these has been recorded by Benson.[6]) That these complications do not occur more frequently is probably due to the fact that the diverticula have wide stomata which allow free drainage and mitigate against stomal obstruction.

Our present case presented a complication of diverticulosis ilei which has not been previously reported.

Case Report

J.S., a 79 year old white woman began having symptoms of intermittent suprapubic pain, urinary frequency and severe dysuria in 1958. She was treated unsuccessfully for urinary tract infection over the next six months. About January 1959 she noted some involuntary leakage of urine which she thought came from the vagina. She retained some urinary control. About one month before being seen at the Calgary Associate Clinic in August 1959, she noted slight vaginal bleeding.

Functional enquiry revealed that she was becoming weaker and that her weight had

decreased from 125 to 101 pounds. She had little appetite, occasional nausea and vomiting but no other gastrointestinal symptoms. She was having regular bowel movements with no melæna or bright red blood.

Physical examination revealed a rather frail old lady, who appeared to be her stated age of 79 years. The chest was clear to auscultation. Cardiac examination revealed normal rhythm with heart sounds of good quality, no murmurs and a blood pressure 150/100. No masses, enlarged organs, tenderness or rigidity were noted on abdominal examination. Pelvic examination was unsatisfactory but revealed a stenosed vaginal vault. Rectal examination was negative.

The patient was admitted to the Holy Cross Hospital, Calgary, on August 31, 1959. Under spinal anæsthesia a cystoscopic examination was performed and the urologist noted a fistulous opening on the floor of the bladder on the right side, just above the right ureteral orifice. Fæcal material could be seen entering the bladder through this opening. He felt that this did not have the appearance of a malignant fistula. A cystogram was then done which showed filling of the terminal ileum and right colon. Diverticula could be seen along the bowel wall and these were erroneously interpreted as being of colonic origin. Plain films of the abdomen showed calcified gallstones (Figs. 1 and 2).

While the patient was still under anæsthesia, a pelvic examination was carried out and this revealed senile vaginal changes associated with stenosis of the upper third of the vagina. The gynæcologist also felt that there was a cystic mass about three inches in diameter in the pouch of Douglas. Definition of other pelvic structures was impossible. It was the gynæcologist's opinion that the mass was of inflammatory origin.

On the basis of the above information it was felt that an abdominal exploration should be carried out. Accordingly, on September 14, 1959 after preparation of the bowel with neomycin, laparotomy was performed. This revealed diverticulosis of the jejunum and ileum. A loop of terminal ileum was adherent to the right side of the bladder. A soft cystic mass lay in the pouch of Douglas. The rest of the pelvis was remarkably free of adhesions or other signs of disease. The gallbladder was adherent to the duodenum, omentum and hepatic flexure of the colon. The terminal ileum was first separated from the bladder by blunt dissection. This revealed the opening into the bladder which was then closed. The portion of the ileum with the diverticulum which had formed the fistula, was resected and end to end anastomosis was performed. The cystic mass proved to be a serous cyst of the right ovary. This was excised together with the right Fallopian tube. Following this the gallbladder was mobilized to be certain there was no cholecystenteric fistula. Large stones could be palpated through its wall. The patient had tolerated the procedure very well to this point, so cholecystectomy was performed.

The patient did reasonably well postoperatively, except for a period of electrolyte imbalance which was moderately difficult to control. She was discharged from hospital on October 4, 1959, and was eating and voiding well. Bowel movements were normal and urinalysis showed that the urine was clear. Urinary control was excellent.

Pathological Report

The specimen consisted of a portion of ileum 32 cm. long, containing a number of

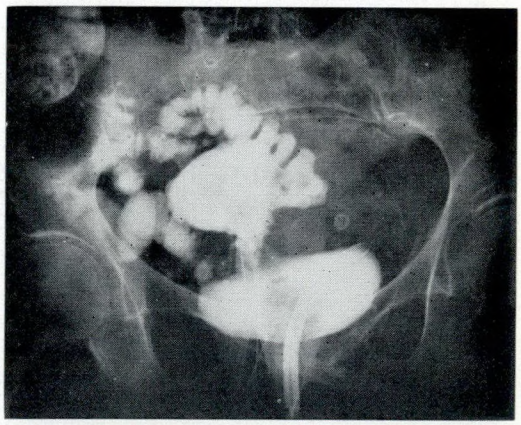

Fig. 1.

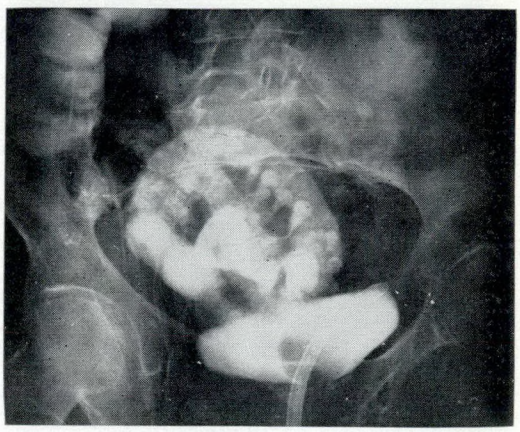

Fig. 2.

Figs. 1 and 2.—Cystograms demonstrating ileovesical fistula.

diverticula and in one area showing perforation with an inflammatory reaction surrounding it. No foreign body was present although a fæcolith was present at the site of the fistula into the bladder. A cyst 11 cm. in diameter, with attached Fallopian tube was present. This was a simple serous cyst. The third specimen was a gallbladder containing four calculi and showing the changes of chronic cholecystitis.

Treatment

Medical treatment[7] of small bowel diverticulosis consists of low residue diets, antispasmodics, mild laxatives and postprandial postural drainage in the prone position. This programme has been of some benefit to those without complications but is of no value to those with complications.

Surgical treatment has consisted of closure of perforations, inversion of diverticula,[7] enteroanastomosis to bypass areas of diverticulosis,[6] and resection with reestablishment of intestinal continuity,[2, 4, 8] The latter appears to be the procedure of choice provided sufficient small intestine is left to carry on adequate absorptive function. In patients with total involvement of the small bowel, as in the case reported here, only a short segment containing the involved diverticulum should be resected with reestablishment of bowel continuity.

Summary

A general discussion of jejuno-ileal diverticula is given with a list of commonly encountered complications. To this is added a case report of an ileo-vesical fistula resulting from diverticulitis of an ileal diverticulum.

Recommended treatment is discussed in general terms.

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Résumé

Les diverticules du grêle, le Meckel exclus, sont rares. Edwards[3] en a trouvé neuf cas au cours de 2820 autopsies, soit une incidence de 0.31%.

Ils sont habituellement asymptômatiques et ne requièrent aucun traitement. Ils deviennent d'intérêt chirurgical lorsqu'ils se compliquent. Le cas rapporté est celui d'une femme de 79 ans qui commença d'accuser douleur intermittente suspubienne, de la pollakyurie et une dysurie importante. Traitée pour infection urinaire sans succès pendant 6 mois, elle nota alors une certaine incontinence urinaire, puis accusa, un mois avant d'être vue au "Calgary Associate Clinic", de l'écoulement vaginal sanguinolent.

Admise au "Holy Cross Hospital", elle subit, sous rachi-anesthésie, une cystoscopie qui démontra un orifice fistuleux duquel s'écoulaient des débris fécaloïdes. Un cystogramme "visualisa" l'iléon terminal et le colon droit et montra des diverticules.

Une laparotomie confirma la présence d'un diverticule iléal fistulisé dans la vessie. La perforation vésicale fut suturée et un segment d'iléon de 32 cm., qui comprenait d'autres diverticules, réséqué. L'opération fut complétée d'une salpingo-ovariectomie droit et d'une cholécystectomie.

SURGICAL TECHNIQUE

TABLE FOR SURGERY OF THE HAND

W. D. BUTT, M.D.,* *Toronto*

THERE HAVE BEEN many tables designed to aid in surgery of the hand. The most common of these is simply a separate table on wheels beside the operating table. The difficulty is that the two tables become separated with any motion on the part of the surgeon or his assistant, and the draping may become unsterile.

Commonly a large arm board is placed under the mattress. This is unstable when the patient is moved and there is no support under the hand during the operation.

This table† is designed with the following features:

1. The legs can be folded and it may be transported easily.
2. The operating surface is easily cleaned.
3. It is attached to the side bar of the operating table so that it must move with the operating table as a unit.
4. It may be rotated on an eccentric axis so that the hand table may be parallel with or at right angles to the operating table, or in any position which is most convenient to the surgeon.
5. The table may be rotated out of the way and the hand thoroughly prepared while the arm is extended over a floor bucket or basin. The table is then draped and rotated under the freshly prepared hand and arm so that complete sterility is maintained. Details of the hand table are depicted in the illustration. The photograph shows the surgeon, assistant and nurse, and the draped table and Mayo stand. The prepared hand is ready for surgery.

RÉSUMÉ

Plusieurs tables ont été proposées pour favoriser la chirurgie de la main à partir de la table séparée, sur roulettes, qui a l'inconvénient de se déplacer trop facilement, jusqu'à la planchette retenue sous le matelas de la table d'opération, qui donne vraiment un support insuffisant.

Une table qui serait retenue d'un côté sous le matelas et soutenue de l'autre par des pattes, semblerait idéale. Elle offre comme avantages:

1. Des pattes qui peuvent se basculer, ce qui facilite son déplacement.
2. Une surface qui peut être nettoyée facilement.
3. D'être fixée à la barre de côté de la table d'opération de sorte qu'elle constitue l'unité de mouvement.
4. De se mouvoir selon un axe excentrique afin d'offrir les angles les plus utiles selon les cas.
5. De pouvoir être écartée au besoin, lors de la préparation de la main, et remise en place après mise des champs pour recevoir le membre.

Les détails sont illustrés.

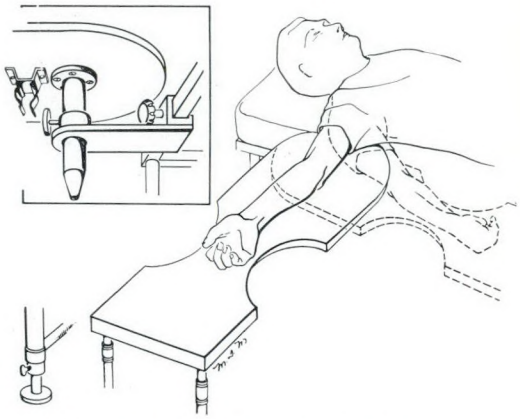

Fig. 1.—Detailed diagram of hand table.

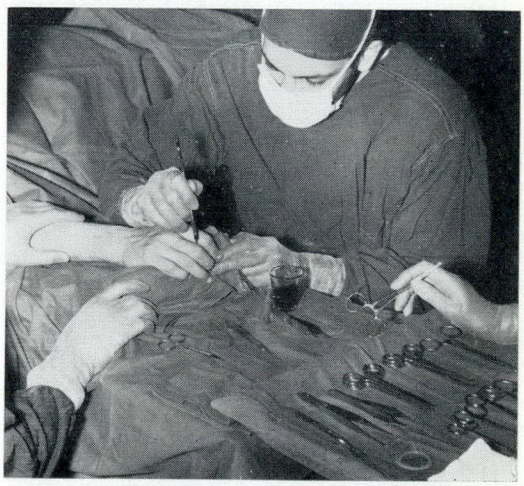

Fig. 2.—Draped table and Mayo stand. The prepared hand is ready for surgery.

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†Glaxo-Allenburys (Canada) Ltd., Distributors, Manufacturers, Bartor Street, Weston, Ontario.

EXPERIMENTAL SURGERY

VARIATIONS PHYSIOLOGIQUES AU COURS DE LA CIRCULATION EXTRA-CORPORELLE DANS LE LABORATOIRE*

EMILE BERTHO, M.D., F.R.C.S.[C],† W. LACHANCE, M.D.‡ et M. BELANGER, M.D.,§ *Chicoutimi, Qué.*

La création d'un service de chirurgie cardio-vasculaire dans un hôpital général de l'envergure de l'Hôtel-Dieu St-Vallier entraîne certaines exigences tant du côté administratif que médical.

Ce service nécessite en effet pour fonctionner des locaux et un matériel très onéreux et une collaboration étroite avec la plupart des disciplines de l'Hôpital, en particulier des services de cardiologie, de radiologie, d'anesthésie, et du laboratoire. Mais en outre un service de chirurgie cardiaque ne se conçoit pas sans un laboratoire de recherches expérimentales. C'est dans de tels laboratoires qu'a commencé cette chirurgie, c'est là où se réalisent les progrès, où s'élaborent les techniques opératoires nouvelles et se crée la sécurité opératoire.

Ce service est né il y a un an à peine. La première circulation extra-corporelle totale expérimentale a eu lieu le 2 février 1959; la première circulation extra-corporelle humaine chez un enfant de six ans ayant une communication inter-ventriculaire a eu lieu le 12 novembre 1959 avec succès.

S'engager dans cette discipline chirurgicale cinq ans après le début de la chirurgie à cœur ouvert offre déjà un avantage sensible car le chirurgien peut ainsi bénéficier de l'expérience de centres réputés et travailler avec un matériel éprouvé et moderne, évitant ainsi la période d'essai et de tâtonnement longue et onéreuse.[1-5]

Le travail aujoud'hui présenté, est le résultat des 30 prémières circulations extra-corporelles totales dans le laboratoire. En pratiquant ces 30 circulations extra-corporelles, l'objectif ultime n'était pas tellement d'essayer de faire avancer la chirurgie cardiaque mais de mettre au point cette chirurgie dans le laboratoire et de comparer les résultats obtenus avec les résultats des centres d'avant-garde, avant de transposer cette chirurgie à l'humain. En chirurgie cardiaque, et ceci s'applique à toute chirurgie, le succès dépend de l'honnêteté des résultats de l'expérimentation.

Ces 30 circulations extra-corporelles ont permis d'éprouver d'une façon sûre:

1. l'appareil cœur-poumon-artificiel.
2. la compétence et l'habileté des techniciens.
3. l'entraînement des infirmières.
4. les différentes techniques opératoires actuellement au point pour la correction des lésions cardiaques.
5. l'efficacité du laboratoire et de l'anesthésie.

Ces 30 circulations comprennent toutes celles qui ont été pratiquées entre le 2 février 1959 et le 23 juin 1959. Il n'y a pas eu de période d'essai ou de circulations rejetées. Les résultats sont exposés en photos, tableaux, graphiques et commentaires et celà avec la plus grande objectivité.

Le système pompe-oxygénateur employé a été le système Dewall-Lillehei (Fig. 1); pompe à doigts sigma-moteur et oxygénateur à bulles. L'oxygénateur (Fig. 2) est constitué d'un tube en mayon d'un pouce ½ de diamètre par 65 cm. à 75 cm. de long; par l'extrémité inférieure de ce tube arrivent le sang et l'oxygène. Le sang arrive par une seule ouverture centrale entourée d'au moins 150 ouvertures minuscules pour l'oxygène. L'extrémité supérieure est trouée sur 10 cm. Ces trous ont 1 cm. de diamètre; le sang est démoussé à ce niveau par des éponges de Stain-o-steel nettoyées par un procédé à la soude caustique et imbibées de Silicone traité à l'éther. Le sang retombe sur un filtre en forme de mouchoir. Cet ensemble (tube, éponges, filtre) est placé à l'intérieur d'une "Canister" ayant à sa partie inférieure deux

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*Travail effectué grâce à la collaboration des autorités de l'Hôtel-Dieu St-Vallier de Chicoutimi.
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§Chef du Service du Biochimie.

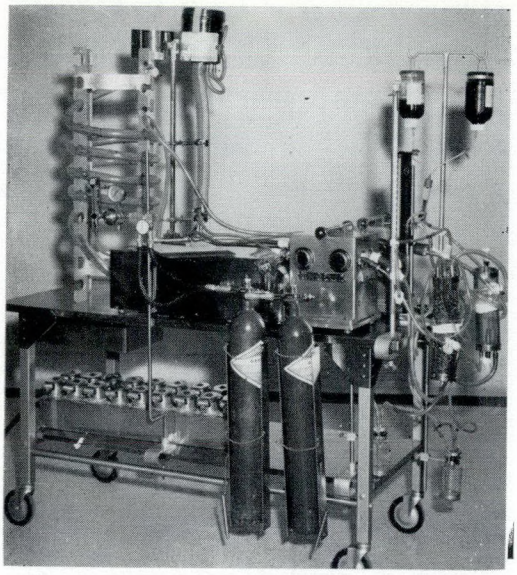

Fig. 1.—Photo de l'appareil cœur-poumon artificiel tel qu'employé à l'Hôtel-Dieu St-Vallier.

sorties, une pour le niveau du sang et l'autre pour l'écoulement du sang oxygéné dans le serpentin. Le sang sort ainsi de cet ensemble démoussé et débarrassé de débris tels que: caillots, fibrine, silicone. Le serpentin constitue le réservoir artériel où la pompe sigma-moteur artérielle puise le sang pour le retourner à l'opéré.

Ce système pompe-oxygénateur comprend d'autre part la succion de cardiotomie qui aspire sous 15 mm. de Hg. le sang à l'intérieur du cœur. Il peut y avoir deux succions de cardiotomie et une autre succion fonctionnant par gravité; celle-ci est employée lors de la canulation de l'oreillette gauche. Cette canulation est importante, surtout dans les gros retours des artères bronchiques et les arrêts cardiaques afin d'éviter la surdistension du cœur gauche et du lit pulmonaire et au besoin pour aspirer les bulles d'air emprisonnées dans l'oreillette gauche et menaçant de franchir l'aorte et ses branches.

Les chiens utilisés ont tous été des chiens bâtards récupérés dans la région. Leur poids (Tableau I) a varié de 8.650 kg. à 31 kg., avec une moyenne de 15.526 kg. Chaque animal, une heure avant d'être anesthésié reçoit morphine 1/6 gr. et atropine 1/150 gr. L'anesthésie est faite uniquement avec du pentothal intraveineux à 50 mg. au c.c. L'anesthésie est superficielle. Le chien anesthésié et intubé respire par lui-même jusqu'à l'ouverture du thorax. A ce moment, la respiration est contrôlée à l'aide d'un appareil automatique sous air comprimé. L'air est de beaucoup préférable, car l'oxygène pur chasse l'azote du sang et augmente la pression partielle de l'oxygène dans le sang. L'artère fémorale gauche est toujours canulée avec un cathéter de polyéthylène et la pression prise de façon continue sur un appareil à mercure et périodiquement sur papier enregistreur. Les tracés électrocardiographiques de même que l'électro-encéphalogramme sont contrôlés continuellement au moyen d'un visoscope et à certains moments ils sont également enregistrés sur papier (Figs. 3 et 4). La température rectale est prise à volonté à l'aide du thermocouple et le chien repose sur le matelas de la machine therm-o-rite. Ainsi sont créés des conditions exactement semblables à celles exigées dans la salle d'opération humaine. Nous

Fig. 2.—Ensemble oxygénateur et chambre de démoussage. Tube de mayon, éponges de Stain-o-steel, filtre, "canister".

nous servons toujours du thermocautère. Le "ground" du thermocautère chez le chien est obtenu en plantant une aiguille dans une patte-arrière.

Nous n'avons jamais pratiqué de groupes sanguins chez les chiens. La mortalité par incompatibilité sanguine chez le chien étant de l'ordre de 10%, les accidents sont rares et les chirurgiens de la plupart des centres reconnus ne procèdent pas au groupement sanguin des animaux. Autant que possible cependant, nous choisissons un chien donneur ayant des caractères physiques se rapprochant le plus possible de l'animal à opérer.

Le chien donneur, suivant son poids, reçoit de 4 à 7 mg. de succinylcholine. Cette dose n'est jamais dépassée. Cette posologie a toujours été suffisante et efficace pour au moins 20 minutes. Il est ensuite intubé et hyperoxygéné. Le sang est prélevé au niveau de l'artère fémorale dans des bouteilles siliconées de 500 c.c. contenant 18 mg. d'héparine et 30 c.c. de soluté glucosé à 5%. La plupart des chiens donneurs sont conservés vivants en leur injectant 1000 c.c. de soluté glucosé à 5% ou de soluté salé physiologique par la veine fémorale. Ils peuvent ainsi être utilisés à nouveau comme donneur après une période d'un mois de repos.

Le sang prélevé est conservé au bain-marie à 37° c. jusqu'à son utilisation dans le cœur-poumon artificiel.

Tous les chiens opérés ont eu une thoracotomie droite dans le 5ième espace intercostal avec hémostase soignée. L'héparine a été donnée à la dose de 1.5 mg. par kilogramme de poids. La veine cave inférieure a été canulée par l'auricule droite et la veine cave supérieure, par la veine azygos. L'artère carotide droite a été canulée avec un cathéter de plus gros calibre possible introduit sur 2 à 3 cm.; on ne le pousse jamais plus loin pour ne pas obstruer la bifurcation carotidienne. A la fin de la circulation, la protamine a été injectée à la dose de 3 mg. par kilogramme de poids.

Le débit du cœur-pouman artificiel (Tableau I) a été de 55 c.c. à 90 c.c./kilogramme/minute avec une moyenne de 72.5 c.c./kilogramme/minute ou de 1112 c.c./minute en moyenne. La pression avant

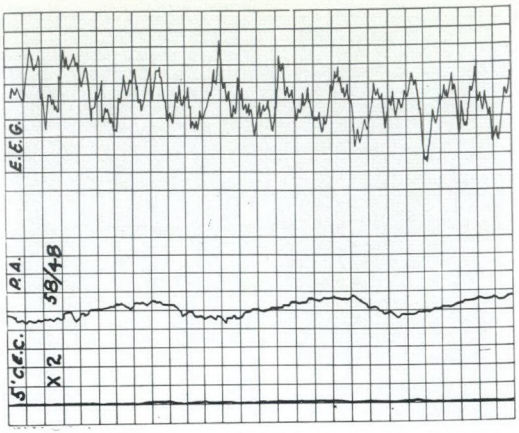

Fig. 3.—Electro-encéphalogramme et pression artérielle (58/48) cinq minutes après le début de la circulation extra-corporelle.

circulation mesurée dans la fémorale était de 125 systolique en moyenne et a varié de 60 à 110 systolique durant la circulation, la moyenne s'établissant à 73 systolique (Fig. 3). La durée de la circulation extra-corporelle totale a varié de 28 minutes à 101 minutes et 15 secondes avec une durée totale de 2004 minutes et 24 secondes et une moyenne de 66 minutes et 48 secondes pour chaque circulation.

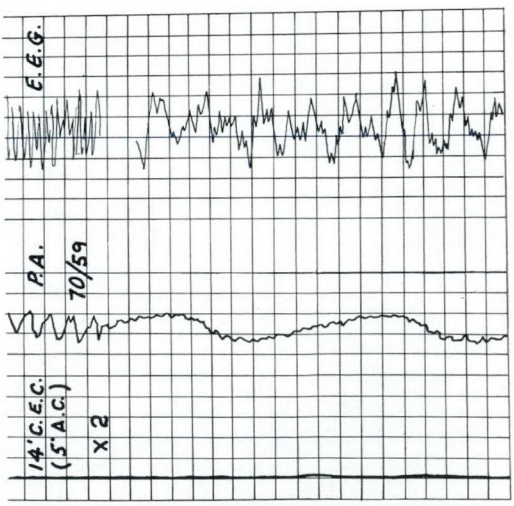

Fig. 4.—Electro-encéphalogramme et pression artérielle (70/54) 14 minutes après le début de la circulation extra-corporelle et cinq minutes après l'arrêt cardiaque.

Avant d'endormir le chien qui aura une circulation extra-corporelle, nous prélevons environ 1500 c.c. de sang chez un chien assez gros (de 60 à 120 livres environ). Ce sang servira à remplir le cœur-poumon artificiel.

TABLEAU I

N° de l'expér.	Date 1959 quant.	mois	N° du chien	Poids de l'animal en kg.	Debit Total en c.c.	c.c./kg.	Pression en mm. Hg. avant	durant	Température en °C avant	après	Durée de la perfusion min.	sec.	VD	PVD	K (Durée en min.)	AD	Saaa	Cog	Ag	AAA	Temps en heures
1	2	2	15	16	960	60	130	80	37.5	35.8	31		+								2
2	6	2	21	17	1020	60	145	90	37.6	35.2	55		+								1
3	10	2	25	24.5	1440	60	140	80	37.5	36.3	28		+	+							
4	12	2	31	15.5	930	60	140	80	37.2	35.7	37		+	+	12′						
5	23	2	29	13.5	900	65	130	80	34.7	32.4	43		+	+	11′						4
6	23	2	16	12.1	780	65	120	70	38.4	38.5	65	30	+	+							
7	27	2	19	13.05	910	70	110	80	38.5	36.7	60		+	+	11′						
8	3	3	39	9.05	630	70	120	60	37.8	36.7	68		+		21′		+				
9	5	3	10	15.30	1050	70	120	60	38.9	36.5	63	30	+		12′	+	+				
10	9	3	26	11.85	720	60	125	65	37.2	35	60	30	+	+							2
11	11	3	41	8.65	720	80	150	50	39.3	36.6	75		+	+							2
12	13	3	35	12.45	1000	80	150	80	37.3	35.9	76		+	+		+					1
13	17	3	42	10.65	880	80	160	95	37.8	35	94	30	+	+		×2			+		
14	19	3	45	16.85	1350	80	105	60	38.6	36.5	84	10	+	+							2
15	1	4	44	22.50	1840	80	135	110	37.8	34.8	78		+	+							2
16	6	4	51	21.75	1760	80	125	80	34.5	38	65		+			+			+		2
17	8	4	48	17.85	1440	80	140	70	38.6	35.2	64		+		22′					+	2
18	13	4	22	31.00	2170	70	100	40	39.7	37.5	65		+		15′			+			
19	15	4	56	14.50	1200	80	130	100	37.9	36.5	67		+	+							½
20	28	4	65	15.25	900	60	130	60	37.6	34.5	61		+								1
21	1	5	64	11.425	990	90	120	70	37.6	33.5	101	15	+	+				+			1
22	5	5	63	23.50	1380	60	135		37.8	35.6	65	20	+	+							2
23	12	5	57	10.925	935	85	95	55	37.6	35.6	83	20	+	+		+					3
24	15	5	75	9.80	750	75	95	90	36.6	34.3	90	10	+	+		+					1
25	20	5	40	12.45	960	80	100	80	36	35	55	50	+	+							2
26	10	6	89	19.40	1200	60	120	60	38.3	34.5	80	20	+	+							
27	16	6	83	19.70	1400	70	160	120	36.2	34.5	71	20	+	+		+					
28	17	6	76	15.35	1200	80	110	75	37.5	34.2	73	10	×2	×2		+					3
29	19	6	77	10.45	850	85	110	75	35.7	34	71	20	×2	×2							3
30	23	6	78	14.00	1120	80	120	75	36.6	33.8	72	12	+	+							2
Moyenne				15.526	1112.83	72.5	125.6	73	37.476	36.66	66	48									

LÉGENDE: VD: Ventriculotomie droite. PVD: Patch ventriculaire droit. K: Arrêt cardiaque. AAA: Aortotomie de l'aorte ascendante. AD: Auriculotomie droite. AG: Auriculotomie gauche. Saaa: Section de l'aorte ascendante–anastomose. Cog: Canulation de l'oreillette gauche. AV: Avant. D: Durant. AP: Après.

La température du chien avant circulation était en moyenne de 37.4° c. et de 36.6° c. à la fin de la circulation.

Au cours de ces 30 circulations extra-corporelles il a été pratiqué:

Ventriculotomie droite:	32
"Patch" infundibulaire droit:	24
Section et anastomose de l'aorte ascendante:	3
Auriculotomie droite:	8
Auriculotomie gauche:	2
Canulation de l'oreillette gauche:	2
Arrêt cardiaque:	7

Il y a 32 ventriculotomies droites car deux fois il y a eu ventriculotomie sur la chambre de chasse et ventriculotomie sur la chambre de remplissage du ventricule droit, puis mise en place de deux patchs sur ce ventricule. Les arrêts cardiaques ont été produits avec du citrate de potassium à 25% (2 c.c. dans 18 c.c. de sang), suivant le principe de Melrose; ou encore à l'acétylcholine, intronisé pour la première fois par Lam de Détroit. Ces arrêts ont varié de 11 minutes à 22 minutes, mais cette technique ne nous a pas satisfaits. C'est dans ces cas que nous avons eu de la difficulté à maintenir une pression normale et les chiens 29 et 10 sont morts de nécrose cardiaque. Actuellement nous avons complètement abandonné ces méthodes d'arrêt cardiaque. Nous utilisons présentement une solution électrolytique[8] froide qui nous donne des survies définitives avec arrêt cardiaque au-dessus de 50 minutes. Les suites opératoires ont été bonnes et le chien a marché très tôt

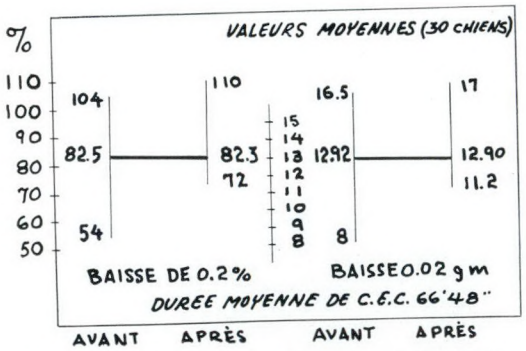

Fig. 5.—L'hémoglobine était avant circulation extra-corporelle de 82.5% ou 12.92 gm. en moyenne avec maximum de 104% = 16 gm. 5 et minimum de 54% = 8 gm. et après de 82.3% = 12.90 gm. en moyenne avec maximum de 110% = 7 gm. et minimum de 72% = 11.2 gm. donc une baisse moyenne de 0.2% = 0.02 gm.

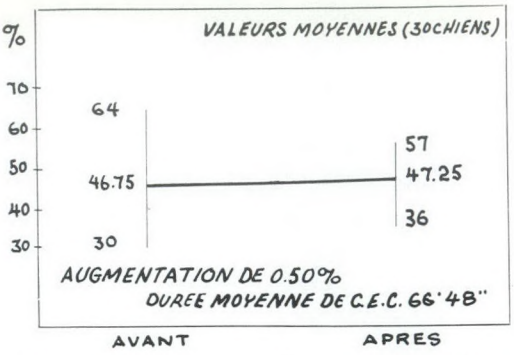

Fig. 6.—L'hématocrite était avant circulation extracorporelle de 46.75% de moyenne avec maximum de 64% et minimum de 30% et après de 47.25% de moyenne avec maximum de 57% et minimum de 36% c'est-à-dire qu'il a été enregistré une augmentation moyenne de 0.50%.

après l'opération (Tableau I). Le tube thoracique enlevé dans la soirée avait drainé en moyenne 50 à 100 c.c. de sang.

Le tableau II indique la survie, les incidents au cours de l'opération et les causes de la mort.

Nous attribuons une mort, celle du chien N° 25, au cœur-poumon artificiel: le démoussage inefficace a entraîné des pertes de sang considérables et la pénétration de 200 c.c. d'air dans le circuit artériel. Nous avons enregistré un mauvais démoussage à quatre reprises soit: pour les chiens N^{os} 40-89-83-78 sans conséquence cependant.

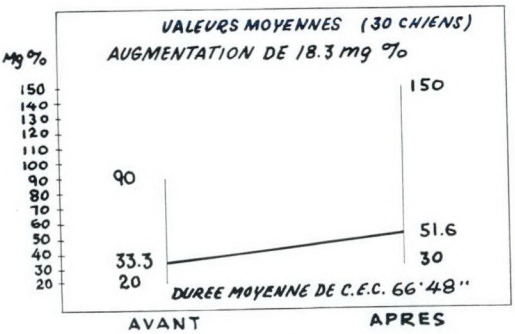

Fig. 7.—L'hémoglobine plasmatique était avant circulation extra-corporelle de 33.3 mg. pour 100 c.c. de moyenne avec maximum de 90 mg. et minimum de 20 mg. et après de 51.6 mg. pour 100 c.c. de moyenne avec maximum de 150 mg. et minimum de 30 mg. c'est-à-dire une augmentation moyenne de 18.3 mg. pour 100 c.c. de sang et le chiffre d'hémolyse le plus élevé n'a pas été enregistré dans la circulation la plus longue, car celle de 101′ et 15″ avait seulement 80 mg. d'hémoglobine plasmatique après circulation.

TABLEAU II

N°	Date 1959 quantième	mois	N° du chien	Durée de la perfusion min.	sec.	Incidents au cours de la circulation	Survie	Causes de la mort
1	2	2	15	31			Vivant	
2	6	2	21	55			Vivant	
3	10	2	25	28				La chambre de démoussage ne fonctionne pas, finalement 200 c.c. d'air pénètre dans système artériel.
4	12	2	31	37		Patch trop perméable	16J	Insuffisance cardiaque (ascite-pleurésie); il avait eu arrêt cardiaque.
5	23	2	29	43		Ouverture de l'aorte ascendante perte de 400 c.c. de sang	15J	Œdème aigu du poumon (nécrose du V.G.); il avait eu arrêt cardiaque.
6	25	2	16	65	30	Hémorragie au niveau de l'aorte ascendante postérieure.	Vivant	
7	27	2	19	60			Vivant	
8	3	3	39	68		Hémorragie au niveau de l'anastomose postérieure		Hémorragie sur l'aorte ascendante postérieure à la suite d'arrêt cardiaque; manque de sang.
9	5	3	10	63	30			Nécrose cardiaque.
10	9	3	26	60	30		Vivant	
11	11	3	41	75			Vivant	
12	13	3	35	76		Petit trou sur la face post - externe de la V.C.S. (suture avec soie 000000)	7J	Insuffisance cardiaque (pleurésie hémorragique): patch trop large.
13	17	3	42	94	30	Bloc auriculo - ventriculaire	1J	Bloc auriculo-ventriculaire par hématome septal auriculaire.
14	19	3	45	84	10		Vivant	
15	1	4	44	78			16J	Pneumothorax par plaie ouverte.
16	6	4	51	65			119J	Sacrifié.
17	8	4	48	64		Turbulance dans le tube d'oxygénation	5J	Insuffisance cardiaque (il avait eu arrêt cardiaque).
18	13	4	22	65			4H	Hémorragie (vraisemblablement par incompatibilité sanguine).
19	15	4	56	67			21J	Œdème du poumon. Epanchement pleural.
20	28	4	65	61		Turbulance dans le tube d'oxygénation	40J	Diarrhée.
21	1	5	64	101	15		Vivant	
22	5	5	63	65	20	Turbulance dans le tube d'oxygénation	25J	Abcès péricardique. Œdème du poumon.
23	12	5	57	83	20		Vivant	
24	15	5	75	90	10		Vivant	
25	20	5	40	55	50	Mauvais démoussage	Vivant	
26	10	6	89	80	20	Mauvais démoussage	8H	Hémorragie. Incompatibilité sanguine?
27	16	6	83	71	20	Mauvais démoussage panne de courant: 1′ 30″	3J	Sacrifié: décérébré
28	17	6	76	73	10		7J	Sacrifié (insuffisance cardiaque) Ascite-épanchement pleural.
29	19	6	77	71	20		25J	Sacrifié (ascite-épanchement pleural).
30	23	6	78	72	12	Démoussage médiocre	Vivant	

LEGENDE.—H-heures: J-jours.

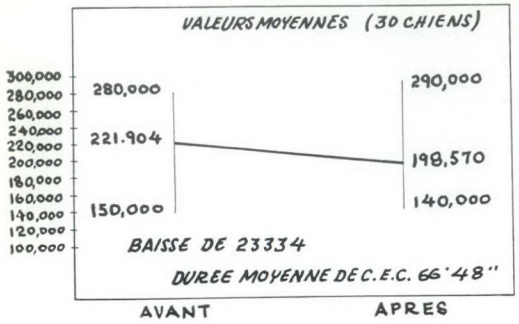

Fig. 8.—Les plaquettes sanguines étaient avant circulation extra-corporelle de 221,904 en moyenne avec maximum de 280,000 et minimum de 150,000 et après de 198,570 en moyenne avec maximum de 290,000 et minimum de 140,000, c'est-à-dire une baisse moyenne de 23,334.

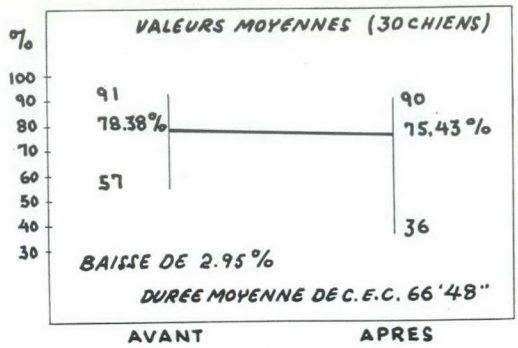

Fig. 10.—Les polynucléaires neutrophiles étaient avant circulation extra-corporelle de 78.38% en moyenne avec maximum de 91% et minimum de 57% et après de 75.43% en moyenne avec maximum de 90% et minimum de 36% c'est-à-dire une baisse moyenne de 2.95%.

La cause en a été retrouvée: les éponges de Stain-o-steel étaient stérilisées huit jours à l'avance et le silicone était devenu sec et inefficace. Une turbulence un peu trop énergique dans le tube d'oxygénation a été remarquée trois fois (chiens 48-65-63) sans conséquence. Il y a eu une panne de courant d'une minute et 30 secondes, (chien N° 83). La pompe s'étant arrêtée au moment où le cœur était ouvert, le chien est demeuré ensuite décérébré et a dû être sacrifié trois jours plus tard. Cet accident nous a incité à faire installer en chirurgie cardiaque humaine une unité spéciale d'urgence pour la salle d'opération humaine. Elle consiste en un dynamo fonctionnant à l'essence. Nous sommes convaincus qu'un système d'urgence pour tout l'hôpital n'est pas suffisant, car il ne règle pas le problème de la panne locale qui demande toujours un certain temps pour être réparée. Or en chirurgie à cœur-ouvert, une minute ou deux minutes de panne de courant peuvent être fatales pour l'opéré. Au cours de la création d'une communication inter-auriculaire et de sa réparation, il s'est formé un hématome sur la région du nœud de Tawara (chien N° 42) et celui-ci est mort 24 heures plus tard malgré l'installation du pace-maker artificiel. Les chiens 89 et 22 sont morts quatre heures et huit heures après l'opération. Nous avons attribué ces morts à une incompatibilité sanguine. En effet ces chiens ont présenté un saignement incontrôlable.

Nous avons pu conserver vivants 12 chiens ayant des "patches" sur la région infundibulaire du ventricule droit. Ces animaux sont en excellente santé et pério-

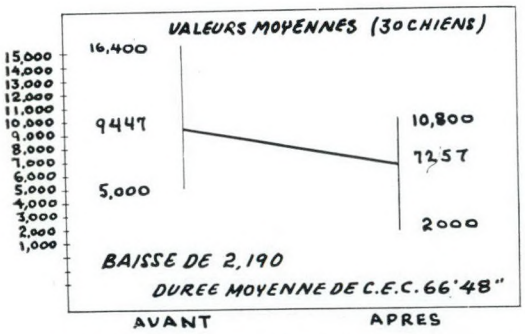

Fig. 9.—Les globules blancs étaient avant circulation extra-corporelle de 9447 en moyenne avec maximum de 16,400 et minimum de 5000 et après de 7257 en moyenne avec maximum de 10,800 et minimum de 2000, c'est-à-dire une baisse moyenne de 2190.

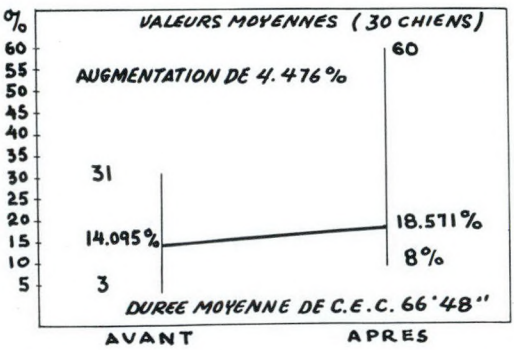

Fig. 11—Les lymphocytes étaient avant circulation extra-corporelle de 14.095% en moyenne avec maximum de 31% et minimum de 3% et après de 18.57% en moyenne avec maximum de 60% et minimum de 8%, c'est-à-dire une augmentation moyenne de 4.47%.

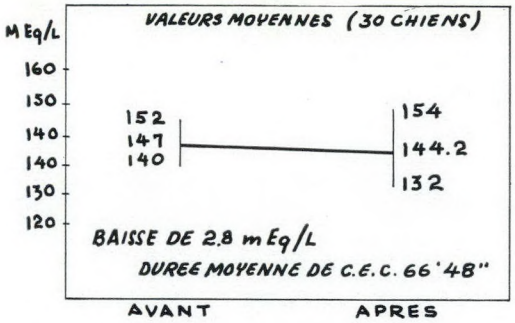

Fig. 12.—Le sodium artériel était avant circulation extra-corporelle de 147 mEq./l. en moyenne avec maximum de 152 et minimum de 140 et après circulation de 144.2 mEq./l. en moyenne avec maximum de 154 et minimum de 132, donc une baisse moyenne de 2.8 mEq./l.

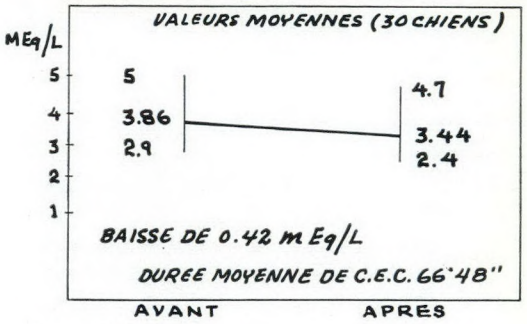

Fig. 14.—Le potassium artériel était avant circulation extra-corporelle de 3.86 mEq./l. en moyenne avec maximum de 5 et minimum de 2.9 et après circulation de 3.44 mEq./l. avec maximum de 4.7 et minimum de 2.4 donc une baisse moyenne de 0.42 mEq./l. en moyenne.

diquement, ils seront l'objet d'étude hémodynamique et cinéangio-cardiographique. S'ils meurent éventuellement, une étude anatomique complète en sera faite.

La série simplifiée de graphiques qui va suivre indiquera les résultats hématologiques et biochimiques pratiqués avant et après les circulations extra-corporelles.[6, 7] Les résultats présentés proviennent de moyenne établie sur ces 30 chiens. Les résultats sont également basés sur une moyenne de 66 minutes et 48 secondes de circulation extra-corporelle totale pour chaque chien.

Chaque critère de l'hémogramme complet est analysé. La formule sanguine comprend:

Sang Arteriel
- L'hémoglobine,
- L'hématocrite,
- L'hémoglobine plasmatique,
- La leucocytose,
- Les polynucléaires neutrophiles,
- Les lymphocytes,
- Les plaquettes sanguines.

Les éléments biochimiques analysés sont les suivants:

Sang Arteriel
- L'oxygène,
- Le CO_2,
- Le PCO_2,
- Le pH,

Sang Veineux
- L'oxygène,
- Le CO_2,
- Le PCO_2,
- Le pH,

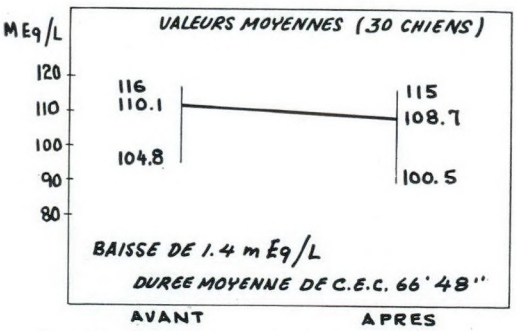

Fig. 13.—Le chlore artériel était avant circulation extra-corporelle de 110.1 mEq./l. en moyenne avec maximum de 116 et minimum de 104.8 et après circulation de 108.7 mEq./l. en moyenne avec maximum de 115 et minimum de 100.5 donc une baisse moyenne de 1.4 mEq./l.

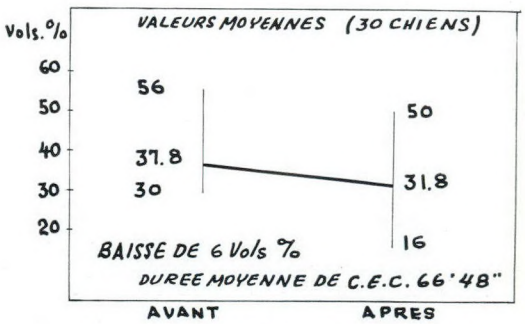

Fig. 15.—La réserve alcaline était avant circulation extra-corporelle en moyenne de 37.8 vols % avec maximum de 56 et minimum de 30 et après circulation de 31.8 vols % en moyenne avec maximum de 50 et minimum de 16 donc une baisse moyenne de 6 vols %.

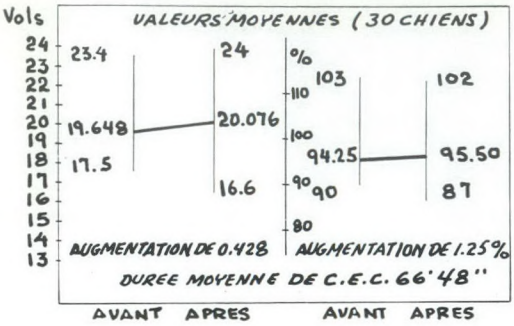

Fig. 16.—L'oxygène artériel était au début de la circulation extra-corporelle de 19.648 vols ou 94.25% en moyenne avec maximum de 23.4 vols ou 103% et minimum de 17.5 vols ou 90% et à la fin de la circulation de 20.076 vols ou 95.50% en moyenne avec maximum de 24 vols ou 102% et minimum de 16.6 vols ou 87% donc une augmentation moyenne de 0.428 vols ou 1.25%.

Sang Arteriel

La réserve alcaline,
Le sodium,
Le chlore,
Le potassium,
L'électrophorèse des protéines

Sur chaque graphique, la moyenne calculée au cours de ces 30 circulations extra-corporelles totales est inscrite avant et après circulations ainsi que les chiffres maximum et minimum obtenus au cours de ces circulations.

Conclusion

Le résultat des 30 premières circulations extra-corporelles dans le laboratoire est exposé.

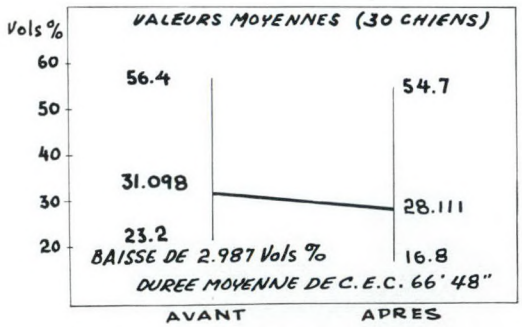

Fig. 17.—Le CO_2 artériel était au début de la circulation extra-corporelle de 31.098 vols en moyenne avec maximum de 56.4 vols et minimum de 23.2 vols et à la fin de la circulation de 28.111 vols en moyenne avec maximum de 54.7 vols et minimum de 16.8 vols donc une baisse de 2.987 vols %.

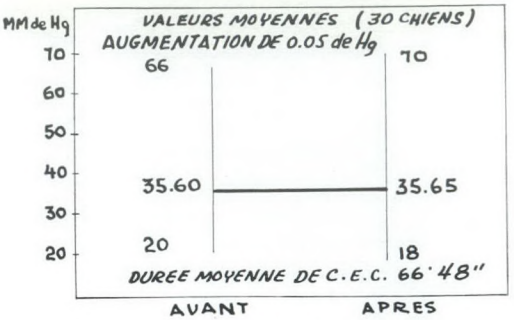

Fig. 18.—Le PCO_2 artériel était au début de la circulation extra-corporelle de 35.6 mm. de Hg en moyenne avec maximum de 66 et minimum de 20 et à la fin de la circulation de 35.65 mm. de Hg en moyenne avec maximum de 70 et minimum de 18 donc une augmentation moyenne de 0.05 mm. de Hg.

Ces 30 premières circulations extra-corporelles ont permis de mettre au point, dans un département nouveau, cette nouvelle discipline. Les résultats obtenus nous ont autorisés à transporter cette chirurgie spécialisée sur le plan clinique. Le cœur-poumon artificiel utilisé a été la pompe sigma-moteur avec l'oxygénateur à bulles (Dewall-Lillehei).

Les résultats des examens de laboratoires montrent des variations minimes avant et après circulations extra-corporelles. L'hemoglobine plasmatique a augmenté en moyenne seulement de 18.3 mg. pour 100 c.c. Les globules blancs ont été les plus touchés. Une baisse en moyenne de 2190 a été enregistrée. Les autres éléments de la formule sanguine ont montré des changements insignifiants. Les électrolytes

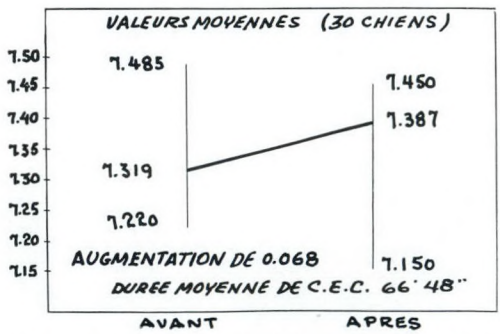

Fig. 19.—Le pH artériel était au début de la circulation extra-corporelle de 7.319 en moyenne avec maximum de 7.485 et minimum de 7.220 et à la fin de la circulation de 7.387 en moyenne avec maximum de 7.450 et minimum de 7.150 donc une augmentation moyenne de 0.068.

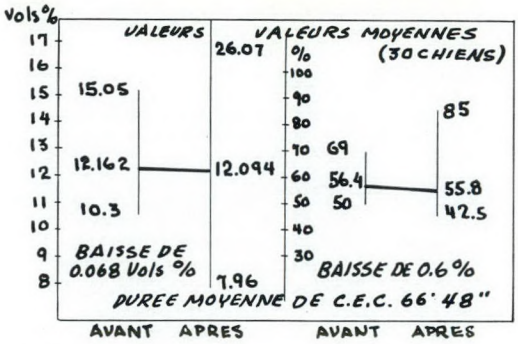

Fig. 20.—L'oxygène veineux était au début de la circulation extra-corporelle de 12.162 vols ou 56.4% en moyenne avec maximum de 15.05 vols ou 69% et minimum 10.3 vols ou 50% et à la fin de la circulation de 12.994 vols ou 55.8% en moyenne avec maximum de 26.07 vols ou 85% et minimum 7.96 vols ou 42.5% donc une baisse moyenne de 0.6%.

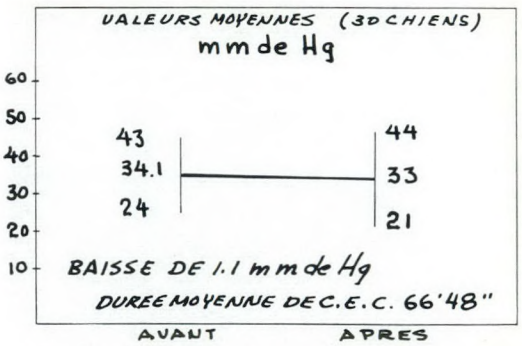

Fig. 22.—Le PCO_2 veineux était avant circulation extra-corporelle de 34.1 mm. de Hg en moyenne avec maximum de 43 et mimimum de 24 et après circulation de 33 mm. de Hg en moyenne avec maximum de 44 et minimum de 21 donc une baisse moyenne de 1.1 mm. de Hg.

ont également été peu influencés. L'étude des gaz a été pleinement satisfaisante. L'oxygène artériel n'a jamais été inférieur à 87% et n'a pas dépassé 103% avec moyenne de 95%. L'oxygène veineux s'est également maintenu en moyenne autour de 55%. Le pH a très peu varié. Ces chiffres indiquent qu'il y a eu un débit sanguin au cours de ces circulations se rapprochant du débit physiologique.

La durée moyenne de chaque circulation extra-corporelle a été de 66 minutes et 48 secondes. Différentes opérations ont été pratiquées au cours de ces circulations. Les différents tableaux résument les résultats obtenus au cours de ces circulations. Nous avons omis volontairement de donner le pourcentage de survie. Le tableau II résume les causes de la mort qui est survenue soit en fin d'intervention (trois chiens) soit dans les 24 heures (trois chiens) soit de trois jours à 119 jours (12 chiens). Les causes de ces morts sont attribuées soit à l'infection ou à une insuffisance cardiaque. D'autres animaux ont été sacrifiés pour étude anatomo-pathologique. Actuellement 12 chiens survivent et sont en parfaite santé. Parmi ces survivants nous reconnaissons des chiens ayant subi des circulations très prolongées, en particulier le chien N° 64 qui a été 101 minutes et 15 secondes sur l'appareil cœur-poumon artificiel, et a subi une ventriculotomie droite, plus un "patch" sur l'infundibulum du ventricule droit et une cannulation de l'oreillette gauche.

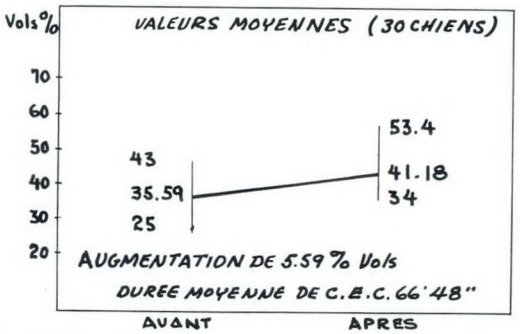

Fig. 21.—Le CO_2 veineux était au début de la circulation extra-corporelle de 35.59 vols % en moyenne avec maximum de 43 et minimum de 25 et à la fin de la circulation de 41.18 vols % en moyenne avec maximum de 53.4 et minimum de 34 donc une augmentation moyenne de 5.59 vols %.

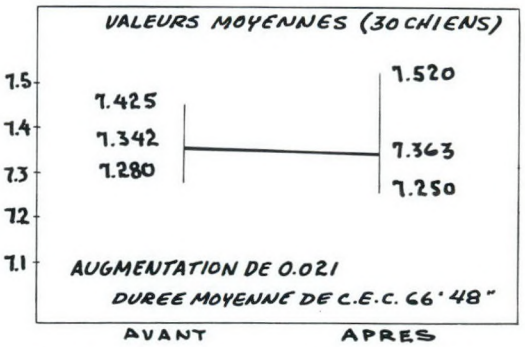

Fig. 23.—Le pH veineux était avant circulation extra-corporelle de 7.342 en moyenne avec maximum de 7.425 et minimum de 7.280 et après circulation de 7.363 en moyenne avec maximum de 7.520 et minimum de 7.250 donc une augmentation moyenne de 0.021.

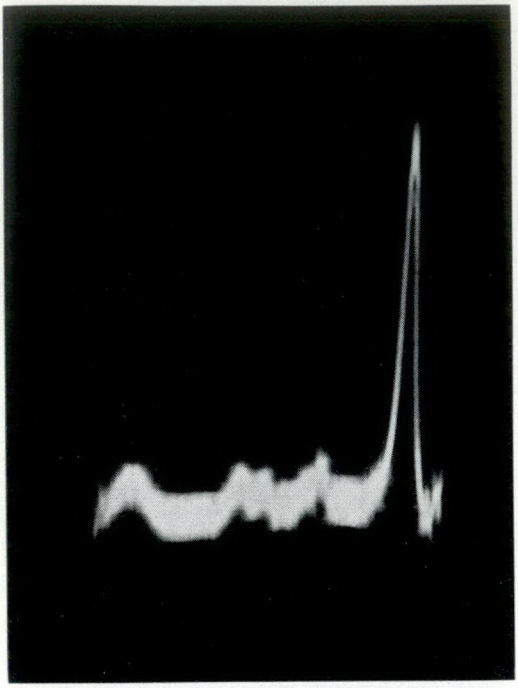

Fig. 24.—Electrophorèse des protéines:
Les protéines totales varient entre 4.68 g. % et 6.50 g. %. La fraction albumine est unique, et représente environ 40% de toutes les protéines sériques. Comme le signalent la plupart des auteurs, il est habituel de reconnaître la présence de 2 à 3 fractions globulaires alpha, 2 à 3 fractions beta et 1 ou 2 fractions gamma. La formule protéinique des chiens dépend de plusieurs facteurs, notamment de l'âge et du régime alimentaire plus ou moins équilibré des animaux.
Sur ces 30 circulations extra-corporelles il n'y a pas eu d'électrophorèse après circulation extra-corporelle pour des raisons qui sont actuellement réglées.

Remerciements

Nous remercions de façon spéciale l'équipe de nos collaborateurs immédiats: Mademoiselle Charlotte Lavoie, i.l., en charge du service interne chirurgical de notre département, et ses collaboratrices: Mademoiselle Jeanne Viel, i.l., Mademoiselle Jacqueline Gilbert, i.l., Mademoiselle Solange Favreau, i.l., Monsieur Marcel Gagné, diplômé en technologie électronique et spécialisé dans le fonctionnement du cœur artificiel, Monsieur Marc Buteau, assistant Technicien et Monsieur Cormier, en charge du chenil. Les photos illustrant le texte ont été prises par le Docteur Anastasiou, Résident en chirurgie à l'Hôtel-Dieu St-Vallier.

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Summary

Statistical results of our first 30 extra-corporeal circulations in the experimental laboratory are presented.
These results stimulated us in attempting open-heart surgery on humans.
The special artificial heart-lung pump used was the sigma-motor type with bubble oxygenator (Dewall-Lillehei).
The blood tests performed before and after extra-corporeal circulation showed variations of no significance.
The plasmatic hæmoglobin averaged 18 mg. % of increase. The white cell counts however dropped to an average of 2190. The other features of the blood picture showed no significant changes. The serum electrolytes were little influenced by the circulation. The gas evaluation before and after circulation was satisfactory. The arterial oxygen never dropped below 87% and was never above 103%, the average being around 95%.
The veinous oxygen has always been maintained around 58%. The blood pH showed little variation.
This data proves that the blood flow during the circulations was close to the physiological point.
Our extra-corporeal circulations lasted 66 minutes 48 seconds on average. Various surgical operations were performed in the course of the circulations. The figures summarize results obtained in those circulations. We have purposely not given any figures on the survival of the animals.
Table II shows the causes of death at various stages of our experimental surgery, i.e., three dogs died at the endpoint of the operation. three within 24 hours and 12 from three to 119 days after operation.
Death of those dogs was imputed either to infection or heart failure. Some animals were killed intentionally for detailed pathological study.
Twelve of our dogs operated upon are still alive and in good condition. Of these. some have had prolonged extra-corporeal circulation: dog No. 64, for instance. had a circulation of 101 minutes 15 seconds during which we performed a right ventriculotomy and a patch on the infundibulum of the right ventricule along with a canulation of the left auricle.

REPAIR OF THE ANTERIOR CRUCIATE LIGAMENT WITH 8 mm. TUBE TEFLON IN DOGS*

M. A. EMERY, M.D., C.M. and O. ROSTRUP, M.D., F.R.C.S.[C], F.A.C.S., *Edmonton, Alta.*

REPAIR OF THE chronic rupture of the anterior cruciate ligament has long been an unsatisfactory procedure from the standpoint of results. Usually these are highly uncertain. Different materials used have been fascia lata, semitendinosis tendon and cutis.[1-3]

Teflon fabric (poly-tetra-fluoro-ethylene) is an inert slippery woven material that produces minimal tissue reaction.[5] It has been used in various procedures such as blood vessel prostheses,[7] repair of hernial defects,[8] and more recently in the repair of neglected torn ligaments.[4] This last experiment was performed on dogs with replacement of the medial collateral ligament of the knee joint.[4] Good results with regard to stability and tissue reaction were obtained. For this reason it was decided to try this material inside the knee joint with the replacement of the anterior cruciate ligament.

MATERIALS AND METHODS

A total of 11 adult mongrel dogs were used in the experiment. In two dogs the anterior cruciate ligament alone was removed to study the effects of this single injury in an otherwise normal knee. The remaining nine dogs had the left anterior cruciate ligament removed then replaced by a strip of 8 mm. tube teflon. The breaking point of the teflon had previously been determined at 115 lb. The opposite knee was used as a control.

Under general anæsthesia of intravenous nembutal, and tourniquet control, a curved medial parapatellar incision was made. The capsule and synovium were opened along the same line. The patella was then dislocated laterally. With the knee fully flexed an excellent exposure of the internal structure of the knee was obtained. The anterior cruciate ligament was then excised. Following this it was noted that there was only moderate antero-posterior joint laxity with the knee in a flexed position. This knee laxity increased when the tourniquet was removed.

The first drill hole was made running from 0.5 cm. to 1 cm. medial to the tibial tubercle to the tibial insertion of the anterior cruciate ligament. A second drill hole was made from the posterior aspect of the lateral epicondyle of the femur to as far distal on the inner joint surface as possible. In all cases the drill hole was not as far posterior as the femoral attachment of the anterior cruciate ligament.

The teflon was then drawn through the drill holes from lateral to medial aspect. The lateral end of the teflon was knotted so that the knot would not pass through the drill hole. The knot was then sutured with 00 silk to prevent the undoing of the knot. The teflon at the medial side of the tibial condyle was stapled to bone and the teflon sutured to itself with 00 silk. This was done with the knee in a fully extended position and the teflon drawn as tightly as possible. The wound was closed. Following this procedure the antero-posterior movement of the flexed joint was reduced compared with that following section of the anterior cruciate ligament but movement was still slightly greater than that of the normal side.

The leg was then immobilized in a single hip spica for three weeks. Nine of the dogs were sacrificed at 12 weeks. These included the two dogs with the anterior cruciate ligament only removed. The remaining two dogs were examined under general anæsthesia for antero-posterior knee joint laxity, then left for an additional three months. Before sacrifice the dogs were examined under general anæsthesia for anterio-posterior joint laxity. Both hind limbs were amputated through the proximal portion of the femur and the foot was removed at the distal third of the tibia and fibula. The joint was opened and the amount and type of joint fluid was noted. All muscle was excised from the specimen and all the femoral-tibial attachments were divided except the anterior cruciate liga-

*From McEachern Cancer Research Laboratory and the Department of Orthopædics, University of Alberta, Edmonton, Alta.
This work was supported by Grant 825 from the National Research Council of Canada.

TABLE I.—Antero-Posterior Knee Joint Mobility
Dogs No. 1 to 9—Three Months Duration
Dogs No. 10 and 11—Six Months Duration

Dog No.	*Left knee*	*Right knee (control)*
1	++++	+*
2	++++	+
3	++++	+
4	++++	+
5	++	+
6	++	+
7	++	+
8	++	+
9	++	+
10	++	+
11	++	+

*+ = Normal movement.
++ = Slightly increased over normal.
++++ = Marked increase in movement.

ment on the normal side and the teflon replacement of the other side. Ligament strength was tested with a Baldwin Hydraulic Tester No. 6-35.

Results

1. *Gait.* The two dogs with simple removal of the anterior cruciate ligament had a normal gait on walking but tended to favour the affected leg when running or jumping. The nine dogs with teflon replacement limped for a full month following cast removal but at the end of three months only No. 3 dog limped. The rest had no limp on walking nor any apparent disability on more active movements. The two dogs left at six months had no apparent disability.

Fig. 1.—Articular cartilage degeneration after three month instability.

2. *Range of motion.* At the end of the three weeks of plaster immobilization all the dogs had marked limitation of movement. At the end of three months a slight limitation of flexion was noted particularly when the dog was sitting, but no limp resulted. Dog No. 3 had marked limitation of movement.

3. *Evaluation of antero-posterior knee joint mobility.* The dogs were tested under general anæsthesia with the knee flexed to a right angle.

Dogs No. 1 and 2 had the anterior cruciate only removed.

Dogs Nos. 3 to 11 had the anterior cruciate ligament of the left knee replaced with teflon.

Dogs No. 1 and 2 had marked laxity. Of the dogs with teflon replacement, dogs No. 3 and 4 had marked increase in antero-posterior movement. The rest had a slight increase over that of the normal right side.

4. *Joint reaction. Gross appearance: Three months.* Dog No. 3 had considerable atrophy of the left thigh muscles. The musculature of the other dogs was normal when compared to the other side.

Dogs No. 3 and 4 had a marked increase in synovial fluid. In dog No. 4 this was serosanguineous. In dog No. 3 it was clear in colour. The remainder of the dogs had a slight increase in normal appearing joint fluid.

Dogs 3 and 4 had markedly œdematous and brown stained synovium especially in the region of the patella. In the remainder of the dogs the synovium was less œdematous but still showed gross features of synovial reaction.

The articular cartilage was normal in all dogs except dog No. 3 in which it showed marked degeneration particularly over the femoral condyles (Fig. 1).

The teflon fabric was covered either at both ends (dog No. 3) or in its entirety by white firm tissue which shelled from the teflon with comparative ease (Fig. 2).

In three dogs, Nos. 4, 7 and 8 (Fig. 3) fraying of the teflon was noted (Fig. 4).

Fig. 2.—Gross appearance of three month knee joint with white fibrous tissue covering the teflon.

Indeed in dog No. 4 there was only one strand still intact. In dog No. 3 the tibial insertion of the teflon was more medial than in the other dogs and the teflon was still slightly lax in full extension. The teflon in the other dogs was unchanged.

The femoral and tibial insertions of the teflon were covered with fine white connective tissue.

The teflon appeared to have an erosive effect on bone. A smooth-walled sinus tract was formed which exuded a thick somewhat mucoid brown material when the teflon was removed.

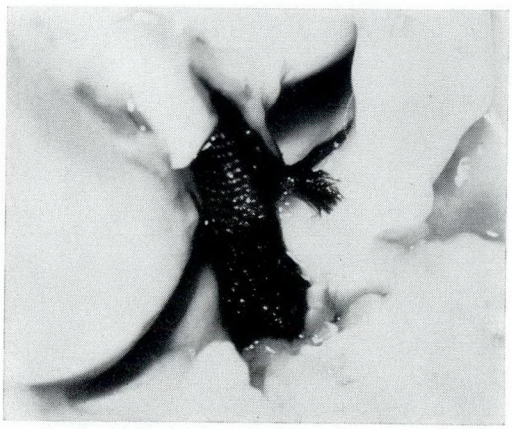

Fig. 3.—The fraying action of teflon. Dogs Nos. 4 and 11 had almost complete fraying.

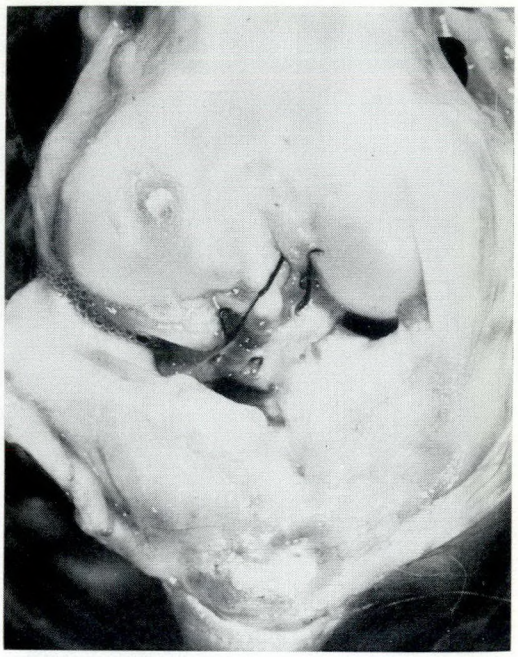

Fig. 4.—Nearly complete fraying of the teflon.

At six months, dog No. 11 had a slight increase in synovial fluid. The synovium was œdematous. The teflon fabric was

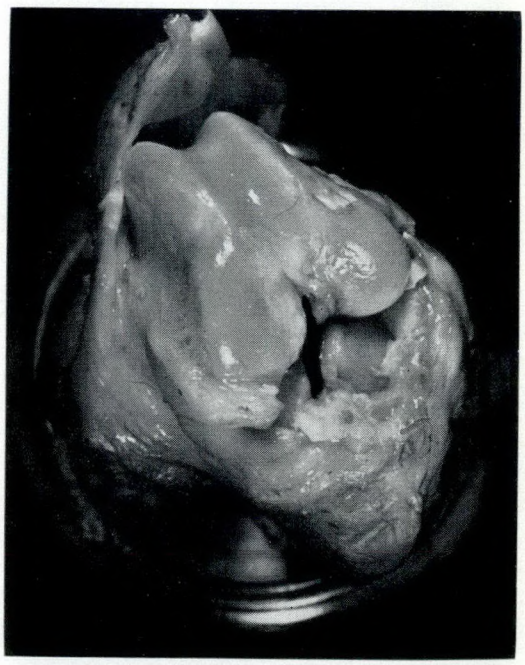

Fig. 5.—A knee joint six months after operation showing almost complete absence of joint reaction.

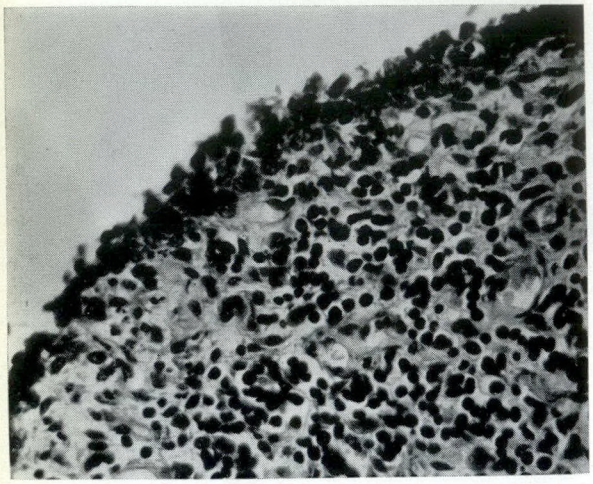

Fig. 6.—Proliferation of the synovial cells and marked chronic inflammatory changes with lymphocytes and plasma cells.

covered with white connective tissue and the teflon fabric partly frayed through.

In dog No. 10 there was no increase in joint fluid. The synovium and articular cartilage looked normal. White connective tissue covered only the ends of the teflon which was intact except for a tiny frayed area in the region of the lateral femoral condyle (Fig. 5).

The erosive effect on bone did not seem any more marked than it was at three months.

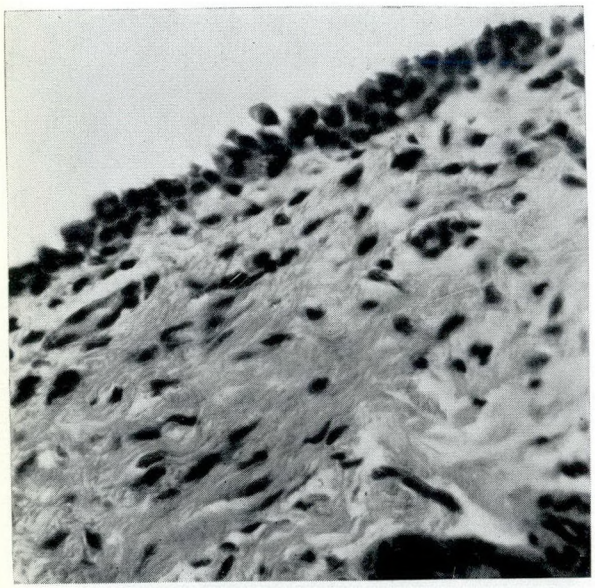

Fig. 7.—Synovium shows little reaction after six months of teflon replacement.

Microscopic appearance. — After three months the synovium showed chronic inflammation with proliferation of the synovial cells and fairly large numbers of lymphocytes and plasma cells. Brown pigment present in macrophages stained for iron (Fig. 6).

After six months the microscopic appearance of the synovium was nearly normal in dog No. 10 (Fig. 7). Dog No. 11 in which the teflon was frayed still showed a chronic synovial reaction similar to that seen at three months. The articular cartilage showed no particular reaction.

The teflon in dogs Nos. 5, 6, 9 and 11 was tested for tensile strength but the chucks of the machine were unable to hold the teflon over 100 lb. This tension was not enough to part the teflon (normal tensile strength 115 lb.). The teflon also held firm at the stapled tibial attachment.

5. *Breaking strength—intact ligament and teflon.*

Table II shows that the normal anterior cruciate ligament was torn free from its tibial attachment in all cases between 70-100 lb. tension. Fraying was noted in dogs Nos. 4, 7, 8, 10 and 11 before testing. Only in dog No. 11 did the frayed area not break before the teflon pulled free from the femoral attachment.

In the remaining dogs the femoral attachment (knotted teflon) pulled through the femoral condyle at 34 lb. to 40 lb. tension.

Discussion

Removal of the anterior cruciate ligament in the dog does not produce much disability although a great increase in the anteroposterior movement of the knee can be demonstrated under general anæsthesia.

TABLE II.—Breaking Point of Ligament (in pounds)

Dog No.	*Left knee (Teflon)*	*Right knee (normal)*
1	—	74
2	—	68
3	—	72
4	Teflon parted	70
5	—	74
6	—	100
7	26	80
8	20	94
9	—	78
10	15	72
11	—	76

Except in dog No. 3 where the teflon insertions were inadequate and in dog No. 4 where the teflon had almost completely frayed through, the teflon gave the joint good stability.

The nearly complete fraying of the teflon in dog No. 4 and the partial fraying in dogs Nos. 6, 7, 10 and 11 are believed due to the constant friction by the articular cartilage and bone on the teflon particularly in the region where it entered the femoral condyle. Aside from this mechanical wear the teflon did not appear abnormal or suffer from any apparent loss of strength. Difficulties in adequately smoothing the inner aspects of the drill holes due to the small joint space no doubt increased the wear on the teflon. This difficulty might be somewhat overcome by working with a larger knee joint. Still, this is a cause for great concern particularly when the teflon must last for years rather than months.

Joint reaction was not great and indeed appeared to subside almost completely in six months. When the teflon remained intact the articular cartilage was not affected.

The type of attachment for the teflon on the lateral femoral condyle was inadequate but the stapled tibial insertion appears to provide an adequate attachment. Therefore it is believed that stapling at both points would provide adequate fixation.

Summary

Eight millimeter tube teflon has been used for replacement of the anterior cruciate ligament in dogs. The dogs recovered nearly full active movement with a normal gait.

Joint reaction was moderate at three months and nearly absent at six months where the teflon remained intact. Stapling and suturing the teflon to itself would appear to provide adequate fixation.

Mechanical wear and tear of the teflon over prolonged periods of time would seem to be the main deterrent in its use. The use of a strip of fascia lata around the teflon could prove of value in the protection of the teflon from mechanical wear and tear.

Acknowledgment

Technical assistance of Mr. W. R. Browne of the Civil Engineering Department, University of Alberta, for his help with the Baldwin Hydraulic Tester, is gratefully acknowledged.

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Résumé

Toutes les méthodes de réparation du ligament croisé antérieur n'ont jusqu'à présent donné que des résultats incertains quels qu'aient été les moyens employés.

Le téflon synthétique est un matériel tissé inerte et glissant qui est déjà employé avantageusement comme prothèse vasculaire, comme complément dans certains déficiences herniaires, et plus récemment dans la réparation ligamentaire, en l'occurence chez les chiens pour la substitution du ligament latéral interne du genou, avec de bons résultats. C'est cette dernière expérience qui a déterminé cette présente étude.

Des 11 chiens dont on s'est servi, deux subirent l'exérèse de leur ligament simplement, alors que les neuf autres eurent en plus la substitution d'un tube de teflon, le membre étant ensuite immobilisé par un plâtre spica simple pendant trois semaines.

La simple exérèse du ligament croisé antérieur chez le chien ne produit que peu d'incapacité, si ce n'est qu'un plus grand mouvement antéro-postérieur du genou peut-être obtenu sous anesthésie générale. Excepté chez les chiens N° 3 et 4 où l'insertion de téflon était inadéquate, les chiens recouvrirent à peu près le plein mouvement actif avec leur allure normale.

Dans le cas où le téflon demeura intact, la réaction articulaire fut modérée après trois mois et à peu près absente après six mois.

Le "stapling" associé à la suture du téflon sur lui-même semblerait assurer une solidité adequate.

L'usure et la déchirure du téflon après un certain temps semblerait constituer le principal obstacle. L'emploi d'une bande de fascia lata protectrice pourrait peut-être solutionner le problème.

SPECIAL COMMUNICATIONS

THE STAGING OF BREAST CANCER
TRIAL OF THE TNM METHOD

A. H. SELLERS, M.D., D.P.H.* *Toronto, Ont.*

In order to facilitate the comparison of results obtained in treatment of cancer of the breast between different centres, not only in our own country, but throughout the world, standardization in the description of the lesion is essential. Professor Sellers is hereby introducing the TNM method of staging beast cancer. Adequate trial of this method, if successful, may lead to considerable progress in this field of surgery by helping to establish a set of uniformly recorded data and universally acceptable statistics.—EDITOR

THE INTERNATIONAL Union against Cancer, through its Committee on Clinical Stage Classification and Applied Statistics,† has recommended a five year clinical trial of the TNM method of staging breast cancer.[1] The trial is international in scope, and began in January 1960. Full details of the method and the trial are available in a booklet entitled "Malignant Tumours of the Breast, Clinical Stage Classification and Presentation of Results".‡

The TNM system provides for the precise description, identification and coding of three components in the clinical extent of disease: the primary tumour (T), the regional lymph nodes (N), and distant metastases (M). Categories are determined at examination before any treatment and remain unchanged, although surgical findings may of course be considered separately. Once the objective clinical findings have been recorded by the examiner, the TNM categories may be examined separately or grouped into clinical stages comparable with those assigned elsewhere by the same system.

To simplify the trial procedure, the Ontario Cancer Treatment and Research Foundation has developed a special form, "Clinical Staging Trial—Breast" (Form CST-B). The form is arranged so that all necessary data for staging by the TNM method may be checked off by the examining clinician without constant reference to any other code or list of definitions. The TNM category and stage may then be assigned by the medical records officer or any other responsible person.

The first version of the form CST-B has been in use in Ontario Cancer Clinics since January 1960. A later version was incorporated in the National Cancer Institute of Canada form and widely circulated in other provinces.

Copies of the form CST-B and instructions for its use may be obtained on application to The Ontario Cancer Treatment and Research Foundation, 69 Bloor Street East, Toronto. Supplies of the form are available to hospitals in Ontario or individual practitioners through the Foundation or any Ontario Cancer Clinic. There is no charge.

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†Between 1950 and 1959, the members of the Committee have been: Baclesse, F., Paris; Barajas-Vallejo, E., Mexico, D. F.; Bucalossi, F., Milano; Copeland, M. M., Washington, D.C.; Denoix, P. F., (Chairman), 1954, Paris; Fischer, A. W., Kiel; Hamperl, H., Bonn; Harmer, M., London; Hultberg, S., Stockholm; Lima-Basto, E., Lisbon; Logan, W. P. D., London; McWhirter, R., San Francisco; Racov, A. I., Leningrad; Roxo-Nobre, M.O., (Secretary), Sao-Paulo; Sellers, A. H., (Secretary), Toronto.

‡Copies of the booklet in French or in English may be obtained from Dr. A. H. Sellers, Director, Division of Medical Statistics, Ontario Department of Health, Toronto, Ontario.

REFERENCE

1. Special article, Clinical stage classification of malignant tumours of the breast, *Canad. M. A. J.*, **82**: 319, 1960.

RÉSUMÉ

L'Union Internationale contre le Cancer, par son "Committee on Clinical Stage Classification and Applied Statistics", a recommandé un essai clinique de cinq ans de la méthode TNM pour classifier le cancer du sein. Cet essai a une portée internationale et a commencé en janvier 1960. Les détails sont exposés dans une brochure intitulée "Malignant Tumours of the Breast, Clinical Stage Classification and Presentation of Results".

Le système TNM prévoit la description précise, l'identification et la codification des trois

composants de l'extension clinique de la maladie: la tumeur primitive (T), les ganglions lymphatiques régionaux (N), et les métastases à distance (M).

Les copies de la brochure en français peuvent être obtenues par l'entremise du Dr. A. H. Sellers, directeur, Division des statistiques médicales, Ontario Dept. of Health.

THE NEW ANATOMICAL NOMENCLATURE AS IT AFFECTS SURGEONS*

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MOST surgeons have been vaguely aware of the recent official changes that have taken place in anatomical nomenclature, but, understandably, many of them have avoided too close a scrutiny. However, anatomists themselves have shown an amazing agreement on the new terminology—even Soviet anatomists having concurred. Therefore, I feel justified in presenting at this time a review of the features of greatest interest to surgeons. Naturally, the reader interested in details must consult the official list of more than 5000 terms.

The new Nomina Anatomica[1] came into being in 1955 at the Sixth International Anatomical Congress held in Paris. Consequently it has been referred to as the N.A. (Paris). During the Seventh Congress held in New York, the International Committee charged with the duty of correcting the list presented a surprisingly short list of revisions which were approved immediately. It was also agreed unanimously that further changes must be avoided. Thus, at last, we would seem to have a reasonably final official list of gross anatomical terms which in a short time will replace all others in textbooks. Indeed, even now, authors are scrambling to make the necessary changes for future editions and the appropriate claims in their prefaces.

The New York Revision (1960) of the Nomina Anatomica (Paris)[2] has much to commend it but it also will present some surprises for practising surgeons. I shall not deal with all the details but rather give an outline of the salient features and changes. Those who have used the Birmingham Revision (1933) of the B.N.A. (1895) will have the fewest changes to make in their thinking. On the other hand, French trained surgeons will meet with the greatest number of difficulties in spite of the fact that the new terminology was approved in Paris. U.S. trained and European surgeons raised on the B.N.A. will meet considerable changes but undoubtedly many of the new terms will have at least a familiar ring.

First, let us consider the general changes. The most startling of these are the following:

(a) Complete deletion of all eponyms. Thus future surgeons may expect their younger colleagues to be ignorant of many favourite terms such as Hunter's canal, Poupart's ligament, pouch of Douglas, Morison's pouch, circle of Willis, etc.

(b) Complete deletion of all hyphens (N.Y., 1960). This rule holds regardless of the apposition of vowels, e.g., sacroiliac.

(c) Complete deletion of all diphthongs so dear to our British colleagues who have now officially agreed to the change (N.Y., 1960). Hereafter, œsophagus and tænia become, more correctly, esophagus and tenia. (Fœtus of course, has always been incorrect, the correct Latin never having had the diphthong.)

(d) Transliteration of the Latin terms into the local language is fully approved. Thus, for example, brachial artery for arteria brachia is quite correct.

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General Terms

None of the general terms will confuse the surgeon when he sees them used correctly. However in his own usage he may never be comfortable with terms such as *ventral* and *dorsal, cranial* and *caudal* which are offered as alternatives but are not replacements for *anterior* and *posterior, superior* and *inferior.* In connection with the hand, it should be noted that the thumb (pollex) is digit I, the index is digit II, and so on.

Bones

Almost all the terms will give no difficulty. Specially noteworthy is the exclusive use of *axis* for the second cervical vertebra and the final replacement of "odontoid process" by the simpler *dens.* The "thoracic inlet" is now officially the *superior thoracic aperture* with its appropriate antonym. The "optic foramen" now becomes the *optic canal* (because it has length.).

There are some noteworthy terms in the osteology of the limbs. The scapula now has costal and dorsal surfaces; medial, lateral and superior margins; inferior, lateral and superior angles. The glenoid is now a *cavity* instead of a "fossa". The clavicle has sternal and acromial ends.

The medial and lateral lips of the bicipital groove now become the *crests* of the *lesser and greater tubercles* of the humerus and the "spiral groove" has again undergone change, now being the *sulcus of the radial nerve.*

The carpal bones are the *scaphoid, lunate, triquetrum* (note the spelling), *pisiform, trapezium, trapezoid, capitate* and *hamate.* The phalanges will no longer be numbered but referred to as *proximal, intermediate* (or *middle*) and *distal.*

In the lower limb, the term *third trochanter* is applied to the gluteal tuberosity for the first time in the human being. The tarsal bones have retained their most used B.N.A. designations. The *talus* now has no official alternative name; thus students of the future will look blank when an old-fashioned surgeon refers to the "astragalus". The *calcaneus* has had *os calcis* restored to it as an official alternative. The *navicular bone* is found now only in the tarsus and the *cuneiforms* are designated *medial, intermediate* and *lateral* instead of first, second and third.

Joints

Probably the most significant changes in this section come in the names of ligaments although the new terms are quite familiar to most readers. In the axial skeleton the *alar ligament* is the old familiar (paired) "check ligament" of the axis. The ligaments at the neck of a rib are now the costotransverse (previously known to many as the "ligament of the neck"), and the *superior* and *inferior costotransverse ligaments.*

In the limbs, some well deserving ligaments of the joints have regained their lost title of "collateral". Thus we now have the *ulnar* and *radial collateral ligaments of the elbow.* Meanwhile, the "annular" ligament (around the head of the radius) has lost an *n* becoming *anular* because some scholar proved the former spelling to be "wrong" and therefore disturbing to his sensibility. The medial ligament of the ankle is now officially recognized to have the alternative name of *deltoid* ligament because of its shape. Since it is never round, the *ligament of the head* of the femur is no longer the "round ligament". Many will be pleased to learn that, finally, *midcarpal joint* has become official for the line of separation of the two rows of carpal bones, but, inexplicably, the equivalent joint in the foot is the *transverse tarsal joint. Subtalar* firmly replaces "subastragaloid", which name is no longer mentioned.

Readers who have been mystified by the variety of ligaments on the dorsum of the sacroiliac joint will be relieved to learn that they have been abolished or, at least, consolidated into one name, the *dorsal sacroiliac ligaments.* Many of us will mourn the passing of the term "semilunar cartilages" of the knee which no longer appears even as an alternative to the slicker and now widely used *menisci.*

Muscles

Most of the familiar terms remain for the muscles. There are some changes of consequence for the intrinsic muscles of

the back but most surgeons can hardly be expected to remember any of them in any case. Most important of these changes is the abolition of the term "sacrospinalis" in favour of the old-fashioned *erector spinae*. The surgeon should be warned, however, that the meaning of this term is limited and it does not include all the intrinsic muscles. The word "lumbodorsal" is replaced by *thoracolumbar* for the well known fascia that covers these muscles.

The most significant change in the terminology of the abdominal muscles concerns the inguinal region. *Conjoint tendon* is demoted to being only an official alternative for *falx inguinalis*, but surely it will not give up without a stubborn fight. The inguinal ligament is recognized as having the following subdivisions: *lacunar* ligament, *pectineal* ligament, and *reflex* ligament.

The most striking changes in name in the muscles of the limbs are the abolition of the well-known term "sublimis" in favour of *superficialis* for the flexor of the fingers and the introduction of *fibularis* as an official alternative to *peroneus* for the three muscles of this name in the leg.

"Hunter's subsartorial canal" becomes the *adductor canal*, the "fossa ovalis" of the fascia lata becomes the *saphenous opening* (*hiatus*). Offered as official alternatives for the *tendo calcaneus* and *quadratus plantae muscle* are *tendo Achillis* and *flexor accessorius*. The committee explained that the use of the name of Achilles was not to be construed as eponymous.

Digestive System

The adoption of the following terms are noteworthy: *cardiac ostium* (of the stomach), *sigmoid* (instead of "pelvic") *colon, rectal ampulla, anal columns, sinuses* and *valves*, and *hemorrhoidal zone* (the part of the anal canal which contains the important venous plexus).

The "lesser sac" of peritoneum no longer appears, being replaced by *omental bursa*, and its "mouth" becomes the *epiploic foramen*.

Respiratory System

The most important changes involve the naming of the tertiary bronchi and the bronchopulmonary segments. It is to be hoped that surgeons will accept the following official terms: *Right Lung*: apical, posterior and anterior segments of the upper lobe; lateral and medial segments of the middle lobe; the apical (or superior), the variable subapical (or subsuperior), medial basal (or cardiac), anterior basal, lateral basal, posterior basal segments of the lower lobe. *Left Lung*: apicoposterior, anterior, superior lingular and inferior lingular segments of the upper lobe; the apical (superior), the variable subapical (subsuperior) and medial basal (cardiac), anterior basal, lateral basal and posterior basal segments of the lower lobe.

Urogenital System

Changes here are generally minor or of interest only to specialists. "Vas" has finally been completely ignored in favour of *ductus deferens*. The urethra is now officially subdivided into *prostatic, membranous* and *spongy* parts. *Perineal membrane* is retained only as an alternative for the *inferior fascia of the urogenital diaphragm*.

Angiology (Including the Heart)

Changes in nomenclature of the heart of greatest significance involve the valves and cusps. *Tricuspid* and *mitral* are reduced to alternates for *right* and *left atrioventricular*. The former has *anterior, posterior* and *septal cusps;* the latter, *anterior* and *posterior*. The aortic and pulmonary valves each have three *semilunar valvules* (not cusps), those for the aortic being *posterior, right* and *left;* those for the pulmonary being *anterior, right* and *left*.

The outstanding change of name for arteries and veins, guaranteed to cause trouble for several decades, is that for the innominates which are now the *brachiocephalic*. There has been a strange enthusiasm amongst anatomists for this change which to some of us appeared to be frivolous. The "internal mammary" becomes the *internal thoracic* for equally pedantic reasons. A new and authoritative list of secondary and tertiary branches of the pulmonary veins was added in the 1960 revision and will be of great interest only to thoracic surgeons.

Nervous System

Most of the new terms in neuroanatomy hold little interest for the general surgeon. Those that do, have been in current usage in English speaking countries. Of course the most striking innovation is the abolition of eponyms already referred to. There are no "Sylvian fissures", "Rolandic fissures", "Clarke's columns" and "aqueduct of Sylvius". They are now (as, of course, they have been for many years) the *lateral* and *central sulci, nucleus dorsalis* and *cerebral aqueduct*. It must be admitted that neither hardship nor great improvement results from these changes. The only advantage is that of regularizing the nomenclature.

The most noteworthy innovation in the peripheral nervous system applies to the name of the eighth cranial nerve which changed its name first in Paris (1955) and again in New York (1960). It is now the *vestibulocochlear nerve*. One is justified in wondering how many years it will take for this name to trip easily off the tongue of the otolaryngologist. The names of the two terminal divisions of the sciatic nerve, after wavering back and forth for almost a century, will now be the *tibial* and *common peroneal* (*fibular*) *nerves*. The latter has *deep* and *superficial* branches (known to some of us previously as the "anterior tibial" and "musculocutaneous" branches of the "lateral popliteal nerve").

In broad outlines, then, these are the changes which appear to me to affect the general surgeon most. I have selected them from a long list of names and undoubtedly have missed words of special interest to individual surgeons. What must be stressed to surgeons is that all anatomists have agreed on an international terminology, something that had never happened before. Officially, there will no longer be several competing systems of nomenclature and so, inevitably, this one system will prevail. Because the International Nomenclature Committee is so determined that no serious tampering will be allowed with the Nomina Anatomica in the future, we can for the first time safely concentrate on teaching one name for each structure, something that has been quite impossible in the past. To expect a sudden switch-over by surgeons trained in the older terms is another matter. The change in the clinical literature will be gradual at first, but surgeons must be aware that, coming as it is from the very roots, this change is inevitable and cannot be held back.

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Résumé

La plupart des chirurgiens sont vaguement au courant des changements apportés à la nomenclature anatomique, quoiqu'ils n'y aient guère pris d'intérêt. Les anatomistes cependant s'entendent au sujet de la nouvelle terminologie, les Soviets inclus. C'est pourquoi il me semble opportun de présenter les points saillants. Le lecteur intéressé poura consulter avantageusement la liste officielle qui comprend plus de 5000 termes.

Le nouveau "Nomica Anatomica" naquit en 1955 lors du VI congrès international d'anatomie tenu à Paris, et on y réfère comme le N.A. (Paris). Lors du VII congrès tenu à New York, le comité international en charge des corrections ne présenta qu'une liste très succincte de revisions qui furent approuvées sur-le-champ, avec l'acquiescement d'éviter tout nouveau changement. Il semble bien qu'on soit sur le point d'obtenir une terminologie anatomique définitive.

Considérons d'abord les changements d'ordre général:

(a) L'annulation des éponymes, vg.canal de Hunter, ligament de Poupart, etc.
(b) L'annulation des traits-d'union, vg.sacroiliaque.
(c) L'annulation des diphtongues, vg. œsophage et tænia deviennent ésophage et ténia.
(d) La transcription de termes latins est tout-à-fait acceptée, vg. artère brachiale pour arteria brachia.

Termes Generaux

Ceux-ci ne porteront pas à confusion. Cependant, il y aura peutêtre quelque malaise à employer ventral et dorsal, crânial et caudal, qui sont offerts alternativement, mais non comme substituts, pour antérieur et postérieur, supérieur et inférieur. Et ce qui regarde la main, le pouce devient le 1er doigt, l'index le 2e doigt, etc.

Os

Ici, peu de difficulté, sauf en ce qui regarde l'ostéologie des membres. L'omoplate possède maintenant des faces costale et dorsale, des bords médial, latéral et supérieur, des angles inférieur, externe et supérieur.

Les phalanges deviennent proximale, intermédiaire et distale.

Au membre inférieur, l'astragale devient le talus et le calcanéum redevient l'os calcis, et les cunéiformes deviennent le médial, l'intermédiaire et l'externe.

ARTICULATIONS

Les divers ligaments que l'on trouve à la portion dorsale de l'articulation sacroiliaques sont appelés simplement ligaments sacroiliaques dorsaux. Les cartilages semi-lunaires du genoux deviennent définitivement les ménisques.

MUSCLES

La plupart des termes demeurent. Cependant, le mot dorsolombaire est remplacé par thoracolombaire, désignant le fascia qui recouvre ces muscles.

Le tendon conjoint devient la faux inguinale. Le canal de Hunter devient le canal adducteur et la fosse ovale, l'orifice saphénique. Le tendon d'Achille demeure.

Les changements en ce qui regarde les systèmes digestif, respiratoire et urogénital semblent déjà connus.

Du côté des vaisseaux, l'artère mammaire interne devient la thoracique interne.

Le huitième nerf crânien devient le nerf vestibulocochléaire.

Ce qui doit intéresser le chirurgiens, c'est que tous les anatomistes aient acquiescé à une terminologie internationale, ce qui n'était jamais survenu avant. Parce que l'"International Nomenclature Committee" est si déterminé à ce qu'il n'y ait pas de mésentente avec le "Nomica Anatomica" dans le futur, nous pourrons pour la première fois enseigner un seul nom pour chaque élément, ce qui était impossible antérieurement.

URINARY DIVERSION*

"Broadly considered, the term urinary diversion indicates the changing of the normal course of urinary flow from the kidney to the body exterior by surgical alterations of its proper channels, or by conversion to others, surgically created for the purpose, or both. Technical procedures for its accomplishment may be limited and simple or extensive and complex. The simple limited techniques (for example, urethrotomy, cystotomy, cutaneous ureterostomy and nephrostomy), are in the main familiar because of early development and long usage. The more recently devised diversionary procedures are not, because to a large extent they are still in the category of surgical innovations, and concerning them there is less general knowledge and considerable speculation. As their usage increases, some of them will no doubt be discarded and others accepted and standardized according to particular indications.

"It is the purpose of this writing to examine as comprehensively as possible, certain of the more promising of recently developed techniques for urinary diversion. This is done in the hope that such will prove of value to some in the management of disorders where the procedure may be essential to palliation for cure.

"GENERAL CONSIDERATIONS. It may be generally stated that while the procedures for urinary diversion have changed, the indications for its performance have not. These indications may be largely included under a single indication with a few additional ones. This is actual or impending obstruction of urinary flow through its normal channels. Congenital anomalies, inflammation, metabolic disorders, and neoplasms may all produce obstruction of the various parts of the urinary tract. These causes represent theoretically an almost limitless variety of etiological agents of urinary obstruction, all having the common feature of impeding or occluding urinary flow through the various components of the urinary tract. There are however, other indications for diversion, far less frequently encountered which are not obstructive in character. One of these is in conditions where diversion of urinary flow is advisable to create conditions optimal for healing of lesions incident to trauma or inflammation. The other is for the relief of disorders in which severe pain is produced by urinary flow through the normal channels. Thus, the principal indications for urinary diversion may be included under one, a consideration of any two, or all three of the following: (1) relief of impending or actual obstruction, (2) the promotion of healing, (3) the elimination of pain. . . ."

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*CROWLEY, R. T. AND SWIGART, L. L.: *Am. J. M. Sc.*, **240:** 232, 1960.

A LOOK AT RUSSIAN SURGERY – 1960

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THIS SPRING I received a letter from the Deputy Minister of Health of the U.S.S.R. stating that the All Union Scientific Society of Surgeons of the U.S.S.R. was holding its annual Congress of Surgery in Moscow, on May 23 to 28, 1960. I was asked if I would be a guest of the Society for 10 days and present a report of 15 minutes' duration. The four scientific topics for discussion were outlined. This was a fascinating invitation from the point of view of a university surgeon. Judging from the east-west tension developing at that time, it was apparent that our elected representatives could do with whatever small bit of help might be forthcoming from a personal professional contact.

The invitation was accepted with no knowledge of who else had been invited, until further news was obtained some weeks later, at the meeting of the American Surgical Association. Here it was learned that four American surgeons had received similar invitations; Doctor Waltman Walters, Professor Michael DeBakey, Professor Henry Swan and Professor Ralph Deterling. At this time, Henry Swan and I made arrangements to fly to Moscow together on a Russian Aeroflot jet two days before the Congress started. We also expressed the hope, in our reply, that we would have an opportunity to visit the famous Professor Uglov in Leningrad after the Congress.

The Summit Conference fell through a few days before we were to leave, with rather sinister headlines in the American press. This proved a source of worry to two of the American delegates, but no one altered his plans.

At the time I received this invitation I was in the midst of preparing a motion picture showing the technique and results of open heart surgical repair of mitral insufficiency and aortic insufficiency, with cardiac bypass. Both these operations are new and our results have been very satisfactory thus far. This movie was completed and Russian titles inserted with the cooperation of Miss Wishart, and her staff, of the Medical Art Department, University of Toronto. In a further attempt to indicate our good will and respect for Soviet surgeons, Russian language slides were also prepared to illustrate my paper on peripheral vascular disease.

Still imbued with goodwill, I approached Dean MacFarlane and President Bissell of the University of Toronto for official letters of greeting. They both complied and the Dean demonstrated a desire to improve east-west relations by preparing his letter typed in both Russian and English. It was beautifully and formally mounted in a red cloth folder containing a large 14-inch photograph which is now a classic in Canadian medicine. The picture showed Doctors Banting and Best on the roof of the Medical Building with the first dog whose life was maintained with insulin. Ball point pens, coins and some Eskimo carvings completed my goodwill accessories.

While waiting for Henry Swan and our Aeroflot jet at Brussels, I had a fascinating chat with a fellow passenger who proved to be one of President Eisenhower's shadow cabinet. His observations on the current crisis were interesting and instructive. Flight departure was announced and there was an atmosphere of excitement aboard the Soviet jet liner as we prepared to take off for Moscow. It was presumed that there were several passengers, like ourselves, making their first trip into the Soviet Union.

With the concept of Russian supermen and a super race built up in my mind by our western press, I was astonished to find that this was like any ordinary jet plane. In fact it was somewhat noisier and less well pressurized than the Boeing 707. It was a comfortable trip with courteous air hostesses and stewards, some of whom could speak a bit of English. It was even reassuring to find that one of the hostesses bore a close resemblance to Queen Eliza-

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beth II. We were pleased to be joined on the aircraft by that charming gentleman, René Fontaine of Strasbourg, France, who proved to be the only official French guest at the Congress. We discussed pleasant memories of his visit in 1956 to our Cardiovascular Division in Toronto.

On arrival at the Moscow airport, we were met by a very impressive delegation, headed by the President of the Congress, Professor Kuprianov of Leningrad, and which included Professor Petrov, Director of the Sklifosovsky Emergency Surgical Institute and Professor Osipov, Director of the Institute of Postgraduate Studies, as well as junior members of their surgical staffs. One woman surgeon, who spoke French, was assigned to look after Professor Fontaine, and Doctor Victor Krelov was to be guide and counsel for Doctor Swan and myself for the week. As guests of the Soviet Government, we merely identified our baggage at the airport and later found it at the hotel. There were no customs or immigration formalities whatsoever.

Doctor Krelov took Doctor Swan and me by car to the Hotel Moscow, one of the leading hotels in the city. It is centrally placed, facing a square and within a few hundred yards of the Kremlin, Bolshoi Theatre and Gums department store. The hotel is a large stone building that could be called oldfashioned in design. The lobby has a high ceiling and there are large staircases and small elevators. The appointments were functional with an obvious absence of chrome and colour. There was a minimum of accommodation in the lobby for lounging about. Everyone appeared to be about some business and it was apparently not a tourist hotel. Our bedrooms were comfortable and modest, complete with a small television set.

In keeping with our warm and flattering reception at the airport, we took over our rooms at the Hotel Moscow without signing a register, or complying with the usual formality of surrendering one's passport. A very high standard of cordial hospitality and thoughtfulness was maintained during our entire stay in Russia.

Outline of Activities

Sightseeing and a welcoming banquet for foreign delegates was arranged on the Sunday preceding the Congress, which ran from Monday morning until Saturday evening. With the exception of special inaugural and closing sessions, the small group of foreign delegates usually had the choice of visiting one of the Institutes for a special display of their work, or attending the Congress. I personally visited three Institutes and on the fourth morning gave a special lecture at the Vishnevsky Institute. Sightseeing was arranged around this schedule and most of the evenings were taken up with some official function. It was a very tight and active schedule, although we were not compelled to take part in this programme and if we so desired were able to wander off on our own at any time.

Some of us were invited to spend two days in Leningrad after the meeting.

Official cars and small buses took us everywhere we wished to go, usually in the company of a guide. All the guides but one were young doctors and between them they had experts in French, German and English. The non medical guide was an official translator at the Ministry of Health. There was someone on duty in a small room on the mezzanine floor of the hotel at all times for the convenience of the foreign delegates. A private dining room had also been assigned for the small group of foreign delegates.

In most countries of Europe, a little knowledge of the French and German language helps one along satisfactorily, but it is a unique experience in Russia to be completely shut off from communication with no knowledge of the language. Thus this elaborate guide service was most thoughtful and useful.

The Congress

The meeting was held in a grand old building called the Hall of Columns, situated in the heart of the city of Moscow and just across the street from our hotel. There is a most imposing convention hall inside the building, which must have been a grand ballroom at one time with ceilings about 45 feet high, with 24 marble columns, each four feet across and over 30 feet high. Between each marble column is a huge chandelier, and at the end of the room

Fig. 1.—The "Hall of Columns" meeting place for the 1500 delegates to the All Union Scientific Society of Surgeons Congress in Moscow. An impressive old hall with marble columns four feet wide, and many elegant chandeliers.

is a large, elevated platform and podium (Fig. 1).

This hall holds 1500 people, so 1500 invitations were sent out to surgeons to attend this Congress. Each of the 17 Russian Republics is sent a number of invitations and they choose their own delegates. It is considered a great privilege to attend and this fact was well demonstrated by the observation that every seat in the hall was filled before the first paper started at 9:30 a.m. and remained filled, apart from a five minute break, until 2 o'clock in the afternoon, which completed the morning session. The afternoon session, from 4 p.m. to 7 p.m., was similarly well attended.

There were two special areas sectioned off on either side of the platform for the foreign guests, so that we were always assured of a seat at any time. By special arrangement, and to accommodate the English speaking guests, they had translation from Russian to English which was received through a small transistor receiver. This was a pocket wireless device complete with ear phones. We could walk out into the corridor and still listen to the English translation. They had a further remarkable show of hospitality by having the entire programme and summary of each paper printed in English. One might expect an arrangement of this kind at an international meeting but it appeared to be a remarkable expression of good will to a small group of about 20 or 30 American and European delegates who could understand English.

The Congress was opened by Professor I. G. Kochergin, Deputy Minister of Health, who outlined the achievements of Soviet medicine during the previous year and spoke at length of one of the fathers of Russian surgery, Professor I. N. Pirogov. This Congress marked the 150th anniversary of his birth.

The business session following the opening speech, was of interest. Professor P. A. Kuprianov of Leningrad, as President of the Congress, read out a list of about 30 names of those officially nominated by a nominating committee to membership in the Administrative Board of the All Union Society of Surgeons. Then in a manner

which made me feel very much at home, he looked out at the audience of 1500 faces and asked if there were any further nominations, and in almost the next breath declared that the nominations were closed. This very august body, leaders of Soviet surgery, were called to the platform.

Professor Kuprianov is a most impressive individual, with a strong, intelligent face and a dignified, well disciplined manner. He appeared resplendent in military uniform, sitting in the centre of the platform, flanked on either side in the front row by Professors Petrovsky, Petrov, Vichnevsky, Kochergin and Bakulev. It was a grand and colourful sight.

There was an interesting system of high intensity spotlights in various places throughout the Congress hall, manipulated by remote control so that the official photographer merely pointed his camera at an object or section of the audience, and it became illuminated.

The formal presentations were indicated on the programme as 10, 15 or 25 minute papers, depending on the importance and seniority of the author. It was interesting that they were held exactly to their time and the meetings ran on schedule throughout the week. On one occasion a speaker was warned by the President that his time was up. He continued speaking and there was an immediate murmur of conversation from the audience. The speaker continued and about one minute later the entire audience commenced clapping in unison. He was forced to conclude at this juncture since no one could hear.

The topics were (1) burns, (2) diseases and injuries of the œsophagus (excluding cancer), (3) conservative and surgical treatment of endarteritis, and (4) tumours of bone. There was one day for each topic with Wednesday and Saturday devoted to business matters. The morning session from 9:30 a.m. to 2 p.m. was assigned to formal presentations on the subject, with the 4 p.m. to 7 p.m. session devoted to discussion. At the end of each day the Chairman of that particular section summarized what he thought were the pertinent points of the day's papers and discussion.

It was interesting that during a very comprehensive and key presentation by Professor B. A. Petrov, outlining a vast experience with surgery of the œsophagus, he gave due credit to Doctor Ross Robertson of Vancouver for his introduction of the use of the jejunal graft.

The foreign guests could choose the particular topic they desired. Doctor Walters spoke on the œsophagus and the other three American delegates and I took part in the programme on peripheral vascular disease. The two British representatives, Professor Charles Rob of London, and Professor Arthur Mackey of Glasgow also chose this subject. Our papers were translated into Russian and a Russian surgeon was assigned to each one of us to read the paper.

I had the honour of having a very senior Russian surgeon, Professor Uglov, Director of the First Medical Institute, Leningrad, read my paper. I took this opportunity to present the formal greetings from Dean MacFarlane and after a brief personal greeting, which I delivered in some memorized Russian, Professor Uglov read the Dean's letter to the Congress. Following this I walked across the platform and presented the formally bound letter, with photograph, to the President of the Congress. This gesture of friendship received a very warm ovation from the assembly. My paper dealt with the results of our surgical replacement of arteries assessed three years after operation, a study which was recently directed by Doctor James A. Key of our Cardiovascular Division. Since the grafting of arteries is a new clinical procedure in Russia they were interested in the long term results. I was told that the Russian slides illustrating this talk were first class translations.

It is interesting that I was feeling rather smug about the fact that I had some Russian slides and said nothing about it to the other guests. At breakfast before the papers were due. Professor Mackey admitted that he had some slides in Russian whereupon it transpired that three or four of us sitting at the table were armed with similar slides, each of us thinking we were quite unique. One of our group suspected that the Russian in his slides was not of very high quality. His suspicions were confirmed when he noticed many smiles and a

good deal of snickering when each of his slides was thrown on the screen.

Doctor DeBakey and I had movies and these were shown at a special session in the Academy of Medical Sciences Building.

Medical Institutes and Surgeons

For the benefit of those who may contemplate a similar trip, I am listing below some of the Institutes in Moscow. This is far from a complete list and only represents those with which I came in contact or visited. These are centres for both undergraduate and postgraduate teaching, as well as research. The director is listed with each Institute.

First Medical Institute
Professor Boris Petrovsky

Sklifosovsky Institute
Professor B. A. Petrov

Vishnevsky Institute
Professor A. A. Vishnevsky

Institute for Thoracic Surgery
Professor A. N. Bakulev—Consultant
Professor S. A. Kolesnikov—Director

Institute for Postgraduate Studies
Professor B. A. Osipov

The Scientific Research Institute
for Experimental Surgical Instruments
Professor M. G. Ananiev

My schedule only permitted me to visit three of the Institutes. With the exception of the Institute for Thoracic Surgery, all the buildings were rather old and similar in design to some of the old hospitals in London, England. There were large wards with beds rather closer together than we might have them, but they were clean and efficient. The patients appeared somewhat subdued according to our standards but cheerful enough. The operating rooms were often very large with high ceilings and as many as two or three tiers of side-wall galleries.

I did not see many shiny, new, chrome plated research laboratories but each Institute appeared to have adequate clinical and animal research areas, usually well equipped with electronic and other types of recording devices. The animal laboratories were often in converted space as one sometimes sees in this country.

One very quickly became conscious of an awareness of seniority on the part of the staff. They still operate a bit on what has been called the "Herr Professor" system in which there is a chief surgeon, and under him, at a considerably lower level of seniority, anything up to 10 or 15 assistants. One would estimate that half of the assistants were women and some had been assisting for many years. There was a very obvious, refreshing and stimulating eagerness on the part of the younger staff for anything that was new, with particular reference to research.

None of our small foreign delegation had an opportunity to visit any of the outlying or provincial hospitals, although I was invited to one non teaching hospital in Moscow. Certainly the Institutes appear to be efficient and well organized. There was a greater emphasis on gadgetry than is evident in Canada. Each of the operating rooms had closed circuit television and the electroencephalogram and electrocardiogram were used for operations that are ordinarily done without this help in Canada. Their sewing machine for suturing vessels is well known and we saw a special metal ring for vascular anastomosis as well as tantalum clips for closing the bronchus.

Visit to Vishnevsky Institute

About 10 visiting surgeons, with three interpreters, arrived by bus at the Institute. We were suitably gowned and observed an operation from a gallery within the operating room. A Blalock type of anastomosis was being carried out by Professor Vishnevsky on a patient with congenital heart disease.

Professor Vishnevsky works very rapidly and uses no gloves because of a skin condition. He had excellent assistants and two efficient scrub nurses. One sat behind him and received used instruments in a sterile basin, the other stood by the instrument table in the conventional manner. During the course of the procedure, he walked away from the operating table and happened to stand beside me for three or four minutes. He explained, through a nearby interpreter, that he does this periodically

Fig. 2.—Lunch at the Vishnevsky Institute. One end of the long table in the professor's office where about 10 of us enjoyed a cold luncheon with wine and cognac. The gentleman pointing is Professor Vishnevsky, to his left is the author, and next to him Doctor Henry Swan.

to relax his nerves. One of his patients that morning was operated upon under general anæsthetic and the other under local anæsthetic. This latter technique was used extensively in Russia until recently and during the last five years it has been gradually replaced by current methods of general anæsthesia. I gather that a good deal of the trend has been a result of several visits, and the kindly interest, of Professor Sir Robert Macintosh of the Department of Anæsthesia, Oxford University.

Professor Vishnevsky completed an end to side anastomosis using a small vitallium ring with four outward protruding hooks. This produced a non suture, intima to intima approximation similar to the technique of the single Blakemore-Lord tubes. It was remarkable how rapidly he executed the anastomosis with this ring and the results appeared satisfactory. There was a lecture room in the hospital with closed circuit television where the visiting members from the Congress observed the operation.

Professor Vishnevsky is unique in that he has a definite preference for male assistants. Four or five of his chief assistants and one of the anæsthetists sought me out and plied me with questions regarding hypothermia. It was remarkable that they were well acquainted with all the publications that had come out of our Unit in Toronto and they were keen to know what more we were doing, with particular reference to deep hypothermia. It was a most stimulating hour in a room adjoining the operating theatre. Two of them spoke good English. They were consistently overly kind in assigning credit to the visiting surgeons for research contributions.

This was our first experience with lunch at an Institute. About 1 p.m. approximately 10 of the foreign guests were invited to Professor Vishnevsky's private office for lunch. We found later that this was routine procedure and the Professor's office in each Institute appeared to be large enough to accommodate a small luncheon gathering such as this. The table was laid with an assortment of meats, cheeses, salad, caviar, black bread, etc., with cognac and Georgian wine, and some sweet pastries for dessert. The Professor's office was across the hall from the operating room, and as can be seen from the accompanying photograph we did not remove our gowns (Fig. 2). Actually, there was further operating in the afternoon. Toasts were given to mutual understanding and friendship, and better exchange of ideas. Professor Vishnevsky is very friendly,

alert and keen, and is editor of the journal, "Experimental Surgery".

During the morning's discussion, it was brought out that our Cardiovascular Unit had had success in open heart surgery for mitral insufficiency and aortic insufficiency and the motion picture illustrating these procedures was to be shown at the Academy of Medical Sciences. A special lecture was requested at the Vishnevsky Institute two days later which I agreed with pleasure to deliver.

On returning this time, the hospital lecture hall was filled with about 50 or 60 members of the staff and apparently some visitors from other units. The movie was shown complete with Russian titles, and the problem of direct vision valvular surgery and the future of valve replacement was discussed. Doctor Doneky, one of the assistants, acted as interpreter and was most efficient. The discussion, particularly that relating to the future of this type of surgery, was most interesting. It was followed by the inevitable food, wine, coffee and cakes, and gifts of photographs and inlaid boxes to take home. The photograph shown in Fig. 3 was taken in front of the statue of Vishnevsky's father, founder of the Institute.

Visit to the Institute for Thoracic Surgery

This is a new Institute in Moscow and it is housed in new modern hospital buildings. It is apparently the result of Professor Bakulev's efforts to have a centre devoted entirely to thoracic surgery and related research. Professor Bakulev was formerly the Director, but he has recently become a consultant and the current Director is Professor Kolesnikov.

Fig. 3.—Professor Vishnevsky (central figure), Professor Ananiev (dark suit) Director of the Institute for Surgical Instruments, and members of the surgical staff of the Vishnevsky Institute.

Here we were met again with the usual warm reception and observed a mitral valvoplasty from an overhanging, modern, viewing gallery in the operating room. This operation was carried out by the standard technique with a lateral incision. During ward rounds, we saw a patient on whom a ventricular septal defect had been closed with cardiac bypass about one week previously. This young lad was in excellent condition and it was ascertained that this was one of their first clinical cardiac bypass operations. Mr. Cleland and Doctor Melrose of England had previously visited the Institute for several weeks and demonstrated the technique. They were using a bubble oxygenator of their own design.

The hospital is divided into five services; one for acquired heart disease, one for congenital heart disease, one for disease of lung, one for disorders of œsophagus, and one for diagnosis and therapy, each of about 50 beds. There is a fine new clinical laboratory and extensive animal laboratory quarters in a converted building adjacent. Their research is what one would expect in a progressive cardiovascular centre in this country. They are dealing with problems relating to extracorporeal circulation, deep hypothermia, plastic valves, plastic bronchus and coronary artery disease. Following this extensive tour, we had a typical delightful lunch once again.

This appeared to be a very progressive Institute which we understood was receiving considerable government support. Professor Bakulev is a most pleasant, intelligent and energetic man who is probably one of the most senior surgeons in Russia today.

Visit to the First Medical Institute

This Institute is directed by Professor Boris Petrovsky and would appear to be not only first class medically, but important professionally and politically. Professor Petrovsky is the very capable editor of the journal Khiirurgie and seemed to be a

rather more serious man than his opposite numbers in the other Institute.

Once again, we encountered an enthusiastic group of assistants, full of questions and keen to improve their technique and learn about current research. Their frank admiration and profound respect for any intellectual accomplishment, whether it be in science or the arts, has been described before and was strikingly illustrated by our association with this institute's surgeons and anæsthetists.

Professor Petrovsky has had success resecting ventricular aneurysms of the heart following cardiac infarction. He operated upon one such case, which proved inoperable, but we saw a movie illustrating the technique. Lunch in the Professor's office with the usual repast and toasts was complete with the giving of presents to all the foreign visitors in the form of books on Soviet art. Fig. 4 shows Doctor Olga Koljutonaja, chief anæsthetist, Professor Boris Petrovsky and Doctor Demetri Venidiktov leaving the First Medical Institute.

Impressions of the Institutes

From what one could gather on a brief visit, it would appear that general surgery in these teaching institutes is done as well as one would see it performed in any first class Canadian or American centre. In peripheral vascular surgery, Russian surgeons are just starting to perform arterial replacement surgery for obstructive disease and aneurysms of the arteries. The most comprehensive clinical report at the Congress was from the First Medical Institute where a total of 28 cases were reported including aneurysms and occlusive disease. They are all doing some of this work experimentally testing our teflon and dacron prostheses as well as one of their own, a material named Levson.

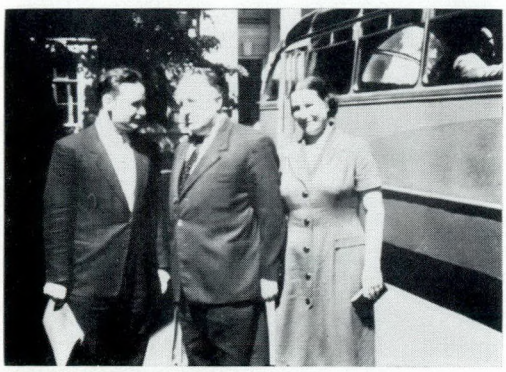

Fig. 4.—Doctor Olga Koljutonaja, Chief Anæsthetist, Professor Boris Petrovsky, and Doctor Demetri Venidiktov leaving the First Medical Institute. Professor Petrovsky is Director of the Institute and editor of the leading journal Khiirurgie.

In heart surgery, closed heart techniques for patent ductus, Blalock procedures and surgery for mitral stenosis are performed by the standard techniques as well as one would see anywhere. In open heart surgery with hypothermia, some of the centres have a limited experience. Cardiac bypass surgery, using the heart-lung pump, is in the experimental stage with the possible exception of that conducted in the Institute for Thoracic Surgery, where a few clinical cases have been operated upon. Thus they are two to five years behind us in experience with peripheral vascular and open heart surgery. There appears to be a good deal of emphasis on surgery for cardiovascular disease in all centres.

One striking feature already mentioned, is their knowledge of American scientific literature. They appear to be quite up to date on all publications and in special fields, such as hypothermia, they quoted articles published many years previously. It was gently and diplomatically suggested to me on one occasion that it was apparent we did not read their literature to the extent that they read ours. That was perfectly correct, not only pertaining to myself but to other members of the party as well. In fact, I found on returning to Toronto that our university library did not have subscriptions for the four leading surgical journals in Russia. This is an obvious oversight (for in at least one journal Khiirurgie there are English summaries at the end of many articles). It is hoped that this will be rectified. As an aid to other libraries the main surgical journals, with the editor and subscription rate per year are listed here. All these journals can be obtained by writing to the one address.

Vestnik Khiirurgie 12 Issues 72 Roubles
Editor Uglov

Experimental Surgery Editor Vishnevsky	6 Issues	18 Roubles
Khiirurgie Editor Petrovsky	12 Issues	72 Roubles
Chest Surgery Editor Bakulev	6 Issues	36 Roubles

Available through:
Ministerstvo Mezhdunaradnoy Torgovly,
V-O Mezhdunarodnaya Kniga,
Smolenskaya Sennaya Ploschad D 32/34,
Moscow, Russia.

As has been mentioned there was evidence of experimental as well as clinical research going on in all the Institutes visited. The amount of experimental research being directed by clinicians is not as great as one would find in a Canadian or American university but one would gather that the amount is increasing.

One hears a great deal about grafting a second head on a dog. Actually, it is a skillful technical procedure but, as in all organ transplant work, these parts only live a week or two and there is a limit to the value of the operation. Organ transplant, including that involving the heart, and regrafting of a dog's amputated leg is under study in the Sklifosovsky Institute by Doctor Danikov, as it is in several centres in Canada and the United States.

One gathered the impression that any piece of research that did prove successful and unique, such as the sewing machine or the grafting procedures, obtained an incredible amount of publicity abroad. It does not alter my belief that their clinical research programme is not nearly as varied or extensive as we have in North America.

Sightseeing and Social Activities

In typical western tourist fashion I took in as many sights as possible in a superficial and sometimes hurried manner. One of the most striking was a visit to what is called the "Pavilion". This is a huge glorified exhibition ground consisting of about 70 buildings or pavilions covering several square miles. This whole pavilion project would appear to be primarily educational but the buildings and grounds are so unique in design and there is so much of interest that it serves as a form of entertainment. Roughly 40 of these pavilions are assigned to the exhibition of subjects in such fields as agriculture, books, electronics, health, history of the Soviet Union, organization of the Soviet Government, etc. These pavilions are of common interest to everyone. In addition, each of the 17 Republics has one to three pavilions demonstrating life in that area and matters of economic and cultural interest. The most modern plane will be open for inspection and one can sit by fountains and eat ice cream. This is apparently one means of unifying the Soviet Union which is made up of 17 Republics, each with a different language.

The university is a huge building on the outskirts of Moscow, 22 stories high in the centre column, and with an enrolment of 40,000. It houses everything under one roof, including administration, classrooms and residences. There is one large wing of this huge building devoted to living quarters. There are two students assigned to a small functional suite with a communal kitchen at the end of the corridor, with men students occupying one wing of a floor, and girls the other.

Perhaps the most impressive experience was an evening at the Bolshoi Ballet where we saw Swan Lake. The incredible Bolshoi Theatre, combined with faultless dancing and fine music proved an emotional experience for me. The theatre has an extremely high ceiling with six tiers of gold loges. I sat in the front row in the orchestra seats and listened to music played by an orchestra of men in black ties (the only time we saw these in Russia). Besides the superb dancing, the costumes were most dramatic. We did not see Ulanova, but the young lady who took the lead was considered by our Soviet hosts to be almost as good as this prima ballerina.

I saw the interesting Tretijakov Art Gallery named after the man who many years ago decided it was time to sponsor Russian art. Gums store which has been described many times is an extensive glass arcade, and the metro underground railway appeared almost too ornate in some places with its beautiful tiled walls, but

it was clean and efficient. The Kremlin churches perched on high ground are ornate evidence of a bygone religious era.

It was a striking experience to visit the mausoleum containing the tombs of Lenin and Stalin. Each day of the week there is a queue, two or three deep, extending along the Red Square for about a quarter of a mile. On being brought to the head of the queue by the guide there was no objection to my being allowed by the guard to step in front of a group of young Pioneers, 10 years of age, that had been in the line for three and one-half hours. They were still well disciplined and one had the feeling that this was what they wanted to do rather than something they were forced to do. The two bodies are beautifully preserved, strongly floodlit and one passes within about 10 feet of them.

On two late evenings I wandered about the streets of Moscow. The very effective, night time illumination of Red Square, including the mausoleum and the famous and bizarre St. Basil's Cathedral, was an experience I shall long remember. There was an hourly change of the guard in front of the tomb.

A formal welcoming dinner was given by the Administrative Committee of the All Union Society of Surgeons for the official foreign guests. Besides the American, British, and French guests already mentioned, Professor Husfeldt was invited from Copenhagen, two representatives from Sweden, five representatives from China and one or two from each of the Russian controlled countries in Europe. There were English and French speaking doctors and interpreters sprinkled throughout the gathering to permit adequate conversation. Following the initial toast of welcome by the Chairman, representatives of each country in turn gave a toast. China led off, through an interpreter, followed by Doctor Walters for the United States and the toasting went on for about 40 minutes. This was carried out, fortunately, during the initial cold meat and salad course, and all the speakers stressed the desire for friendship and better exchange of ideas. The Chinese delegation appeared very disciplined. They were all dressed the same in a very modest type of uniform and kept rather to themselves throughout the period of the meeting and did not appear to encourage conversation. I thought they were somewhat different from my concept of the average, pleasant, friendly Chinese.

I was particularly struck by the absence of excessive drinking. There was one drink before dinner and a rather modest amount of cognac and wine consumed during dinner. The Russians would appear to have a rule about drinking at official functions.

This dinner was more or less duplicated on Saturday evening at the end of the Congress. Once more, each of the countries gave a toast including expression of their thanks. There was a modest attempt at humour in some cases, but by and large most of them were rather serious and the Soviet members present genuinely appeared to appreciate the oft repeated platitudes. I must say that the American representatives and I were given every consideration during these social gatherings.

I was invited to four private dinners and was able to accept three of these invitations. One was by Professor Uglov of Leningrad. He had a quiet, small party in his hotel suite with Professors Swan, Charles Rob, Ralph Deterling and myself with Doctor Venidiktov as interpreter. Professor Uglov speaks fairly good English. He is a small, wiry, unassuming man, with a ready smile and a very charming manner. He is soft spoken and exudes genuine friendship. It was interesting to see this man, born 1000 kilometers from the nearest railroad in Siberia, and now one of the top surgeons in the Soviet occupying the royal suite of the national hotel with its high ceilings, inlaid furniture and ornate walls and ceilings.

A second small private hotel dinner given by Professors Bakulev and Kolesnikov was very gay in the finest Russian tradition and a certain amount of endurance was required in order to enjoy the whole evening.

Two of the invitations were to private homes but I was only able to accept a dinner with Professor Shabonov, who had visited us in Toronto. He is a big, coarse haired, friendly fellow who is Director of

the non teaching Botkin Hospital in Moscow. As you know, there are no private homes as such in Russia. One has rooms in a large, plain apartment house, and the greater one's skill and the more important one's status in labouring or intellectual circles, the better living quarters one is assigned. Professor Shabonov occupied a six roomed suite in the sixth, or top floor of one of these grey stone apartment buildings that run endlessly in Moscow. There was a tiny elevator that would accommodate three passengers and the apartment, although not luxurious, gave the atmosphere of comfort and culture. All the rooms were small but there were book cases up to the ceiling of the living room and extending down the corridor to the front door. As in the case of many Soviet surgeons, Professor Shabonov's wife is also a doctor and he has a son an engineer and a daughter, age 22, who is studying art. The family of five occupy this apartment.

I was the only guest at this dinner and Doctor Venidiktov came as interpreter. This was the most interesting experience of my visit since it was not only an insight into the home life of a Russian family but towards the end of the dinner we discussed politics and international problems and in the presence of Doctor Venidiktov, who I would gather is an important medical political figure in Moscow. Space does not permit an elaborate description of this party. It was essentially friendly and cheerful with joking and good humour. The 22 year old daughter was a charmer by any standards. She had great fun trying her English. Doctor Shabonov told me, through Venidiktov as interpreter, that his wife was so disturbed at the prospect of having me as a guest for dinner that for one week he and his daughter had to encourage her and they told her daily that she was the finest cook in Moscow in order to maintain her morale. Mrs. Shabonov, who is a senior physician in her own right, took this joke in good spirit.

The meal involved initially a small drink of vodka in the living room, then some cognac with the cold meat, caviar, cheese, and salad course. Following this a huge bowl of soup was presented and it is one of their important food items. The Russians, by and large eat more than we do and the size of the bowl was too much for me. Actually, I was told that in the small visitors' dining room in the hotel, they served guests their soup in children's soup dishes. Following the soup there was a steak of excellent quality and the dessert was a pastry. The dining room was very small and the decor gracious but not elaborate.

Doctor Venidiktov asked me if I would like to discuss international events, a subject that had been avoided throughout our stay. He said, with a smile that "The west is so suspicious of us that we thought that if politics were discussed you would think that was one of the reasons why you had been invited to the Congress." The discussion was brief and it was carried out very pleasantly and calmly with absence of strong opinions. As far as I could gather, they appeared to want to know what motivates the Americans to carry on such an aggressive cold war. I had the feeling that they did not appreciate what a source of trouble international communism has been over the years to Americans and Canadians. It was stressed that the average Russian would like an end to the cold war so that the Soviet Union could divert some of their money and energies to building adequate housing, which is in extremely short supply. Apparently, it is possible for a professional couple to have to live in one room, and one of their strongest desires is to have adequate living facilities with some privacy.

Week End in Leningrad

We left the Saturday banquet a bit early and proceeded to the Red Arrow train which runs from Moscow to Leningrad. On the invitation of Professor Uglov, the party included Swan, Boliga of India, Doctor and Mrs. DeBakey, and Husfeldt of Copenhagen. The compartments were small, plain but comfortable, resembling a British railway carriage. Tea with cakes was served by two lady attendants.

After an overnight trip, we were met

Fig. 5.—A relaxing week end at Professor Uglov's country home. From left to right: the author, DeBakey, Husfeldt (Copenhagen), Uglov, Boliga (India) and Swan.

by Professor Uglov's staff at the station on a brilliant sunny day. We were taken to an hotel and later driven 30 kilometers into the country to Professor Uglov's country home, mute evidence of the high position he holds in the Soviet Union. On the way we passed a similar, or perhaps more elaborate country home owned by one of the Soviet's leading poets. Professor Uglov also owns an apartment in the city of Leningrad. We had two enjoyable cold meals, went for a walk and generally had a lazy, pleasant time. The photograph, Fig. 5, shows Professor Uglov and his relaxed guests. Mrs. Uglov played the piano for us and sang extremely well.

We visited the First Medical Institute the following morning, where we saw a lobectomy and mitral commissurotomy performed by Professor Uglov and his excellent assistants (Fig. 6). He has about as elaborate an investigative unit as we had seen and a very fine dedicated staff. Once again the buildings were old. The clinical investigative unit is a converted area but they were carrying out many interesting lines of research.

Professor Uglov showed us some of Leningrad and I visited the renowned Hermitage with its world famous collection of European art. This was where the Czars and Russian nobility lived a great deal of their time and of course not only disregarded Russian art in their collection, but felt compelled, as an index of refinement, to speak French.

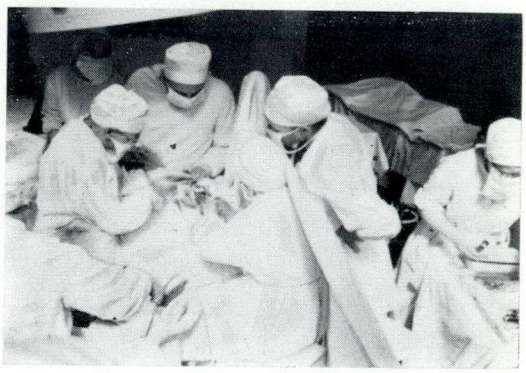

Fig. 6.—A mitral commissurotomy by Professor Uglov of Leningrad. One scrub nurse sits out to one side, immediately behind the operator. There is a sterile basin between them in which used instruments are deposited. There is a second scrub nurse, not shown, in the conventional position at the foot of the table. This was a common arrangement. The two senior assistants on this large staff were women surgeons.

Professor Uglov told us of the difficult time Leningrad had during the war. They were under siege by the Germans for three years, during which time 3000 missiles per day landed on the city, and no building escaped damage. He was in the city during the siege and is a man of fine reputation. It was rather significant that he told us that 100,000 people died of starvation in Leningrad alone during that three year period. Apparently, the bodies were collected each day by a government hearse. It was further evidence of the incredible suffering that Russia experienced during the second great war. Their reported overall death toll is staggering.

We said goodbye to Professor Uglov and his assistants, and were given the usual presents of books and fine Georgian wine. I gave him an Eskimo carving which he appeared to appreciate.

Impressions

At the risk of being stamped as a 10 day authority, I did feel compelled to record some of my impressions. One of my strongest impressions, meeting on a professional level, was that these are ordinary people, less aggressive and perhaps friendlier than some western European nationalities. One does sense a good deal of discipline and official supervision of their activities which would prove most frustrating to us. They are proud of their achievements, ashamed of their shortcomings and fearful of war. Young boys, 14 or 15 years of age will have had three years schooling in English. Recognizing American dress they will ask to speak to you to try out their English. Everywhere in Moscow one sees these groups of young children, with distinctive neck scarves, taking supervised tours of art galleries, museums, etc. (Fig. 7).

In science they appear to have put a large amount of their energy, resources and brains into two or three projects, such as balistics, sputniks and power dams, and have given their success in these fields an immense amount of publicity. They are content to use copies of western refrigerators and anæsthetic machines. Hearing constantly of their great successes in a few things, one loses sight of the fact that they are a poorer country than we are with regard to general standard of living, transportation, building, hospitals, hotels, dress, etc. After having visited five different offices and taken one and one-half hours to have an air ticket changed, one had the

Fig. 7.—One of the many groups of young "Pioneers" on a cultural tour of the Red Square in Moscow.

feeling that bureaucracy of this kind will never compete in material things with the western free enterprise system. Their method of education and their desire to learn is remarkable, however, and we should continue to study their techniques.

Clinical research is very often monotonous, frustrating and discouraging work. It is the occasional success that gives one the erroneous impression that research is dramatic and exciting. In order to maintain a young man's interest in clinical research, he must be given professional prestige and authority as he progresses in seniority and achievement. The success of Soviet research may depend to a degree upon the ability, with their oldfashioned seniority system, to offer that necessary stimulus.

I felt that the ordinary people in Russia and we in the west are not well enough informed of each others motives and mode of life. On the one hand we have a biased free press, on the other a controlled press. Perhaps the answer lies in better communication. Perhaps the Canadian government could assign the cost of one military plane to pay a group of experts to study and implement means of real communication.

I took a small step by arranging to have Doctor Ronald J. Baird, who is joining our staff at the Toronto General Hospital, spend three months at the Institute for Thoracic Surgery in Moscow. To the best of my knowledge this is the first time that an American or Canadian will have received postgraduate surgical education in Russia. The idea of having Doctor Baird study with them was received warmly. It is hoped that this will be a first step in better future communication at the professional level.

RÉSUMÉ

L'auteur relate ses impressions d'un voyage en Russie pendant lequel il assista à titre de conférencier invité au congrès annuel de la Société scientifique des chirurgiens d'U.R.S.S. tenu à Moscou du 23 au 28 mai dernier. Comme preuve de bonne volonté, l'auteur s'arma de diapositives rédigées en russe afin d'illustrer sa communication, ainsi qu'un message du doyen et un autre du président de l'Université de Toronto. Les visiteurs furent accueillis à l'arrivée par une délégation imposante tirée des cadres des principaux instituts médicaux de Moscou. Une fois réglées les formalités douanières ou autres (qui d'ailleurs avaient été réduites au plus simple minimum), les visiteurs furent logés à l'hôtel Moscou où les attendait une hospitalité qui ne devait pas se démentir de tout leur séjour dans ce pays.

Le congrès comprenait un programme bien rempli, tant de séances scientifiques que d'événements sociaux. Les guides affectés aux médecins étrangers étaient eux-mêmes de jeunes médecins possédant le français, l'allemand ou l'anglais. Les réunions furent tenues dans la salle dite "des colonnes", qui peut contenir 1500 personnes. L'invitation à ce congrès constitue un honneur très recherché au sein de la profession médicale; la présence assidue de tous les délégués des différentes républiques en est la preuve. On avait organisé à l'intention des visiteurs étrangers un système d'interprétation simultanée du russe à l'anglais; les programmes comportaient aussi des résumés en anglais.

Bien que présidé par le Pr Kuprianov, c'est au Pr Kochergin que revint l'honneur d'ouvrir le congrès. La durée des communications était fixée à 10, 15 ou 25 minutes selon l'importance du sujet traité et le président de l'assemblée observa toujours cet horaire de près si bien que toutes les communications purent être présentées et que les séances se terminèrent à l'heure indiquée.

Le congrès comportait quatre grands thèmes: à savoir, les brûlures, les lésions non-néoplasiques de l'œsophage, le traitement conservateur et la chirurgie dans les artérites et les tumeurs des os. Les séances se tenaient de 9:30 à 2:00 et de 4:00 à 7:00 heures. A la fin de la journée, le président de la section donnait un résumé des faits saillants de la séance. Les communications des visiteurs furent traduites en russe et chacune fut lue par un chirurgien que l'on avait désigné pour cette tâche. L'auteur choisit de traiter des résultats lointains obtenus dans le remplacement des artères, tels que revus après un recul de trois ans.

Dans ses rares loisirs, il visita plusieurs instituts de médecine et de chirurgie. Il offre même au lecteur qui serait tenté d'en faire autant, une liste des principaux instituts dont il recommande la visite. Même si l'état des bâtiments et des locaux semble quelque peu vieillot à comparer à celui de la plupart des établissements nord-américains, il ne s'y fait pas moins du bon travail. Le personnel de ces instituts est imbu de la notion de hiérarchie de sorte que le "patron" est le maître incontesté dans chacun d'eux. Environ la moitié des assistants sont des femmes. Tous manifestent un vif intérêt aux progrès dans les différents domaines de la médecine. L'auteur prétend avoir décelé un faible pour l'appareillage mécanique ou électronique qui semble une manifestation d'un culte de la machine.

Les visiteurs étrangers assistèrent (en spectateurs) à une anastomose de Blalock pratiquée par le Pr Vishnesvsky, à l'institut qui porte son nom. Le professeur opère rapidement et sans gants. Ses assistants semblent fort au courant des plus récentes découvertes dans le domaine de l'hypothermie et ils assaillirent l'auteur de questions se rapportant à ses propres recherches. L'auteur avait apporté une pellicule cinématographique illustrant sa technique de correction à cœur ouvert de l'insuffisance mitrale et aortique; on le pria alors de prononcer une conférence pour en accompagner la projection. Cette communication fut suivie avec beaucoup d'intérêt de la part des auditeurs.

Les visiteurs étrangers virent ensuite l'Institut de chirurgie thoracique où ils assistèrent à une valvuloplastie de la mitrale. Cet établissement très moderne comprend cinq services d'environ 50 lits chacun et qui se répartissent comme suit: maladies congénitales du cœur, maladies acquises du cœur, maladies des poumons, maladies de l'œsophage et enfin, diagnostic et thérapie. Cet institut était dirigé jusqu'à récemment par le Pr Bakulev qui était l'hôte pour la circonstance.

Au cours de leur visite au Premier institut médical, dirigé par le Pr Boris Petrovsky, les délégués étrangers furent reçus avec la courtoisie habituelle et l'intérêt soutenu du corps médical russe. L'auteur est d'avis que la chirurgie générale pratiquée dans ces institutions est de qualité comparable à celle que peuvent offrir les meilleurs centres canadiens ou étatsuniens. En plus du Teflon et du Dacron, les Soviétiques possèdent leur propre matériel de prothèse vasculaire qu'ils nomment Levson. S'ils ont su maîtriser la technique opératoire à cœur fermé, ils n'ont encore acquis par contre, dans certains centres, qu'une expérience limitée de la technique à cœur ouvert, sous hypothermie, dont la mise au point est d'ailleurs assez récente. Leurs dérivations cardiaques par pompes cœur-poumon ne sont dans la plupart des cas qu'au stage expérimental. Tous ces chercheurs semblent très bien renseignés des progrès de la science nord-américaine—beaucoup plus que nous ne le sommes de leurs propres réalisations.

Profitant de son séjour, l'auteur visita le Pavillon, sorte de foire permanente contenant des exhibits de toutes les Russies. On lui montra également l'Université de Moscou, gratte-ciel de 22 étages servant à 40,000 étudiants, le théâtre Bolshoi où il assista à une représentation de Lac des cygnes, la galerie d'art Tretijakov, nommée d'après le "découvreur" de l'art autochtone et enfin les dépouilles mortelles de Lénine et de Staline dans leur mausolée.

Aux banquets qui marquèrent l'ouverture et la clôture du congrès, on porta des santés et on échangea des protestations d'amitié pendant près de trois quarts d'heure. Tous ces vœux et ces allocutions étaient prononcés sur un ton solennel rarement teinté d'un faible humour. L'auteur fut invité à quelques réceptions intimes dont une chez le Pr Shabonov qui poussa la courtoisie jusqu'à offrir de discuter la situation internationale et la guerre froide. Il eut aussi le plaisir de passer la fin de semaine près de Léningrad à la maison de campagne du Pr Uglov (à qui on accorde ce luxe en vertu de son poste élevé dans le corps médical). L'auteur garde un souvenir ému des quelques heures passées en sa compagnie.

L'impression qui lui est restée de son voyage chez les Russes est celle d'un peuple amical, moins aggressif qu'on est porté à le croire, soumis à une discipline et à une surveillance officielle que nous pourrions difficilement tolérer. Ces gens sont fiers de leurs réussites, gênés de leurs faiblesses et craintifs de la guerre. Leur niveau de vie n'atteint pas le nôtre et la bureaucratie reigne en maître chez eux. Nous gagnerions autant qu'eux à étendre la connaissance réciproque de nos deux peuples. Comme preuve de sa détermination dans ce sens, l'auteur a recommandé que l'un de ses assistants fasse un stage de trois mois à l'Institut de chirurgie thoracique de Moscou. Ce projet est actuellement à l'étude.

CANADIAN JOURNAL OF SURGERY

All communications concerning this Journal should be marked "Canadian Journal of Surgery" and addressed to the Editor, C.M.A. Publications, at C.M.A. House, 150 St. George St., Toronto 5.

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INSTRUCTIONS TO CONTRIBUTORS

Manuscripts

Manuscripts of original articles, case reports, and other contributions should be forwarded with a covering letter requesting consideration for publication in the *Canadian Journal of Surgery*. Acceptance is subject to the understanding that they are submitted solely to this Journal, and will not be reprinted without the consent of the author and the publishers. Acceptance or rejection of contributions will be determined by the Editorial Board. As space is available, a limited number of case reports will be published. Articles should be typed on one side only of unruled paper, double-spaced, and with wide margins. Carbon copies cannot be accepted. The author should always retain a carbon copy of material submitted. Every article should contain a summary of the contents. The Concise Oxford Dictionary will be followed for spelling. Dorland's American Medical Dictionary will be followed for scientific terminology. The Editorial Board reserves the right to make the usual editorial changes in manuscripts, including such changes as are necessary to ensure correctness of grammar and spelling, clarification of obscurities or conformity with the style of the *Canadian Journal of Surgery*. In no case will major changes be made without prior consultation with the author. Authors will receive galley proofs of articles before publication, and are asked to confine alterations of such proofs to a minimum.

Reprints

Reprints may be ordered on a form which will be supplied with galley proofs. It is important to order these before publication of the article, otherwise an extra charge for additional type-setting will be made.

References

References should be referred to by numerals in the text and should be set out in accordance with the *Cumulative Index Medicus* abbreviation of journal name and general style. They should include in order: the author's name and initials in capitals; title of the article; abbreviated journal name; volume number, page number and year. References to books should include in order: author's name; title of book; title of publishing house; city of publication; number of edition (e.g., 2nd ed.); year of publication.

Illustrations

A reasonable number of black-and-white illustrations will be reproduced free with the articles. Colour work can be published only at the author's expense. Photographs should be glossy prints, unmounted and untrimmed, preferably not larger than 10″ x 8″. Prints of radiographs are required and *not the originals*. The magnification of photomicrographs must always be given. Photographs must not be written on or typed on. An identifying legend may be attached to the back. Patients must not be recognizable in illustrations, unless the written consent of the subject for publication has been obtained. Graphs and diagrams should be drawn in India ink on suitable white paper. Lettering should be sufficiently large that after reduction to fit the size of the Journal page it can still be read. Legends to all illustrations should be typed separately from the text and submitted on a separate sheet of paper. Illustrations should not be rolled or folded.

Language

It should be clearly understood that contributors are at full liberty to submit articles in either English or French, as they please. Acceptance will be quite independent of the language of submission. If the contributor wishes, he may submit an informative summary of not more than 300 words in the language other than that in which he has submitted the article. For example, an article in English must carry an English summary and may, if the author wishes, carry a more detailed summary in French.

The Royal College of Physicians and Surgeons of Canadà

NEWSLETTER

Earlier this year, the Trustees of the R. Samuel McLaughlin Foundation announced the creation of a visiting professorship in Canada, the professorship to be known as The McLaughlin Foundation Edward Gallie Visiting Professorship in The Royal College of Physicians and Surgeons of Canada.

In this way, a suitable memorial to the great Canadian surgeon, the late Dr. William Edward Gallie, was established and fittingly dedicated to the free interchange of ideas and teaching methods.

It is the wish of the founders that the visiting professor should visit various medical schools across Canada, taking part in their teaching programmes, lectures, conferences, clinics and rounds. Non university centres will also be included in the itineraries.

The selection of the visiting professor rests with a committee of representatives from The Royal College and the Association of Canadian Medical Colleges, subject to final approval by the Trustees of the Foundation. The responsibility of the Committee includes the choice of areas to be visited and the length of time which the visiting professor will spend at each.

Although the visiting professor may be chosen from any country in the world, and may represent any field of clinical endeavour, it is specially appropriate that the first professor should be a surgeon of the stature of Charles F. W. Illingworth, Regius Professor of Surgery at the University of Glasgow, a gifted teacher and well known author.

Professor Illingworth will arrive in Canada during the last week of September 1960, and will spend two weeks at the University of British Columbia. During the week of October 10, Professor Illingworth will attend the Clinical Congress of the American College of Surgeons in San Francisco, which will be followed by a two week visit to the University of Manitoba. Professor Illingworth's stay in Canada will be concluded with brief visits to The Royal College Headquarters in Ottawa and to Toronto.

In the April 1960 issue of the Canadian Journal of Surgery, the Newsletter announced that plans were being made for a Western Canada Regional Meeting of the College to be held in Saskatchewan in 1960. Subsequently it became apparent that such a meeting would conflict with other meetings planned in that area, and it therefore became necessary to transfer the 1960 Regional Meeting to Southwestern Ontario. The Southwestern Ontario Regional Meeting will be held at the University of Western Ontario and its affiliated teaching hospitals in London on November 15 and 16, 1960. Professor Angus D. McLachlin has been named Chairman of the Committee on Arrangements for this Regional Meeting, and he and his Committee are preparing an excellent programme which will be announced at a later date. An invitation is extended to all Fellows and certified specialists of The Royal College of Physicians and Surgeons of Canada living in Southwestern Ontario to attend this meeting. All qualified medical practitioners in the area will also be welcome to attend.

Of interest to many in the profession is the announcement by Council, of the election to Fellowship, under Article 3, Section 3 of the By-laws, of the following surgeons:

Dr. Fernand Montreuil of Montreal, Professor of Otolaryngology at the University of Montreal

Dr. J. V. V. Nichols of Montreal, Associate Professor of Ophthalmology at McGill University

Dr. George W. Armstrong of Ottawa, Consulting Orthopædic Surgeon at the Ottawa Civic Hospital, Past-president of the Canadian Orthopædic Association and President of the Canadian Medical Protective Association.

The Gordon Richards Memorial Lectureship for 1961 will be presented at the Annual Meeting of the College, to be held

in Ottawa, January 19 to 21, 1961. This will be the first time that this Lectureship, which is sponsored annually by the Ontario Cancer Treatment and Research Foundation, has been presented at the Annual Meeting of the College. The name of the 1961 lecturer has not yet been announced..

W. Gordon Beattie, F.R.C.S.[C],
Honorary Assistant Secretary
August 19, 1960.

NOTICES

PROFESSOR F. E. BRYANS JOINS THE JOURNAL'S ADVISORY BOARD

The Editorial Board is pleased to announce that Professor Frederick E. Bryans of Vancouver, B.C. has consented to replace the late Professor A. M. Agnew on the Advisory Board, representing the specialty of Gynæcology. Dr. Bryans graduated in medicine from the University of Toronto in 1946, and qualified by examination for fellowship in the Royal College of Surgeons of Canada (Obstetrics and Gynæcology) in 1952.

Dr. Bryans recently succeeded the late Dr. Agnew as Professor and Head of the Department of Obstetrics and Gynæcology in the University of British Columbia, Faculty of Medicine and the Vancouver General Hospital.

The Board welcomes Dr. Bryans and looks forward to his long and pleasant tenure as the Journal's adviser on matters pertaining to his specialty.

Prof. F. E. Bryans

DR. MAURICE DUFRESNE LEAVES THE JOURNAL

The Advisory Editorial Board regrets that Dr. Dufresne has resigned as assistant editor of C.M.A. publications. He has been responsible in large measure for the more recent issues of the *Canadian Journal of Surgery*. The Editorial Board decided at the outset that each article submitted for publication should be read and commented upon by two of its members in addition to the Chairman. The transmission of these comments to the authors of manuscripts without offence, is one of the more difficult duties of the editor and requires at times much diplomacy. Dr. Dufresne possessed the tact and humour needed to do this successfully. We wish him well in the new venture he has undertaken and hope he will continue to take a friendly interest in the welfare of the journal.

Robert M. Janes,
Chairman, Editorial Board

FORTHCOMING MEETINGS

UNIVERSITY OF TORONTO POSTGRADUATE COURSE IN OTO-LARYNGOLOGY

A graduate course in oto-laryngology will be presented by the Staff of the Department of Oto-laryngology on May 11, 12 and 13, 1961. They will be assisted by two distinguished guests, Dr. Philip E. Meltzer, Professor of Oto-laryngology, Harvard Medical School, and Chief of Oto-laryngology, Massachusetts Eye and Ear Infirmary, and Dr. W. G. Hemenway, Department of Oto-laryngology, University of Chicago.

The first session will begin in the afternoon of May 11, in the Royal York Hotel, Toronto, in association with the Section of Oto-laryngology of the Ontario Medical Association. The remainder of the sessions will be held in the clinical areas of the University of Toronto.

An attempt will be made to assess, discuss. and demonstrate the newer procedures employed in the surgery of deafness. The present surgical treatment of head and neck problems will be presented with special consideration of the new conceptions of the responsibilities of this specialty in their management.

The fee for the course will be $40, and will include a complimentary dinner.

All enquiries should be addressed to the Director, Division of Postgraduate Medical Education, University of Toronto.

REFRESHER COURSE IN EYE SURGERY —UNIVERSITY OF TORONTO

The Faculty of Medicine, University of Toronto, will hold a Refresher Course in Eye Surgery from March 20 to 22, 1961. The instruction will consist of lectures, operative sessions and a special symposium on cataract surgery.

Dr. Robert N. Shaffer, University of California, San Francisco, and Mr. B. W. Rycroft, F.R.C.S., London, England, will be guest surgeons. The staff of the Department of Ophthalmology will contribute extensively.

The course will be limited to 50 members and is open to eye, ear, nose and throat specialists. Application should be made to the Director, Division of Postgraduate Medical Education, Faculty of Medicine, University of Toronto, Toronto 5, Ontario, Canada, before January 31, 1961.

On March 18 there will be a Departmental Research meeting and Dr. H. M. Burian, University of Iowa, will be guest speaker. Members of the Eye Surgery Course are invited to attend.

NEW YORK UNIVERSITY

A three day symposium on the surgery of endocrine organs will be presented by the Schools of Medicine of the New York University Medical Center from November 17 to 19, 1960. Participants will include a guest faculty of some of the most distinguished authorities in this field, among whom are Doctors Oliver Cope, Edwin Ellison, David Hume, Michael Lepore, John A. Oates, Olaf H. Pearson, Milton H. Porter, William W. Scott, Paul Wermer, Sidney Werner and others. Sessions will be under the direction of Dr. John H. Mulholland, professor and chairman, Department of Surgery, and Dr. S. Arthur Localio, professor of clinical surgery.

Surgical diseases in which the endocrine system is directly involved or in which endocrine influences are important will be discussed. Functioning tumours of endocrine structures, derangements of internal secretions that are amenable to surgical treatment, and endocrine factors in metastases of cancer are considered from physiologic and diagnostic standpoints.

A round table discussion by all the participants on Saturday morning, November 19, will conclude the symposium.

Further details and application may be obtained from the Office of the Associate Dean, New York University Post-Graduate Medical School, 550 First Avenue, New York 16, N.Y.

AMERICAN COLLEGE OF SURGEONS

The 46th Annual Clinical Congress of the American College of Surgeons will be held in San Francisco, California, from October 10 to 14, 1960.

Doctors from all parts of the United States as well as from many other countries will attend sessions at this largest meeting of surgeons. More than 1000 will take part in the various programs as authors of research reports, teachers of postgraduate courses, participants in panel discussions, lecturers, and operating surgeons in motion pictures and closed-circuit telecasts.

Major addresses will be made by Dr. I. S. Ravdin, Philadelphia, Chairman, Board of Regents and incoming President of the College; Dr. Joseph Trueta, Oxford, England, who will speak on trauma and the living cell. Dr. Wendell M. Stabley, Director of the virus laboratory at the University of California, and Nobel winner in chemistry, will deliver the Martin Memorial Lecture, named for the College founder, Franklin H. Martin, on the subject of virus-cancer relationships. Mr. Leslie Philip Le Quesne, London, England, will give the annual Baxter Lecture, speaking on body fluid disturbances resulting from stomach obstruction. On the final evening, October 14, initiates will be presented for fellowship, honorary fellowships will be conferred and officers inaugurated.

The retiring President of the College is Dr. Owen H. Wangensteen, Minneapolis. Headquarters for the meeting will be the Civic Auditorium, with some sessions scheduled at nearby hotels.

Dr. Leon Goldman, Professor and Chairman, Department of Surgery, University of California School of Medicine, Berkeley, San Francisco, is Chairman of the local committee on arrangements.

THE SOUTH WESTERN ONTARIO SURGICAL ASSOCIATION

The Annual Meeting of the South Western Ontario Surgical Association will be held on November 16, 1960 at Victoria Hospital, London, Ontario. Clinical sessions will begin at 9 a.m.

For further information write to Dr. R. M. McFarlane, Secretary, Surgery Office, Victoria Hospital, London, Ontario.

HUMBOLDT UNIVERSITY, BERLIN

The celebration of the 250th anniversary of the Charité of the Faculty of Medicine will be held in Berlin from November 6 to November

19, 1960, in connection with the 150th anniversary of the Humboldt University.

Applications for participation are to be directed to the Committee for the Preparation of the 250th anniversary of the Charité, Berlin N 4, Schumannstrasse 20-21, c/o Professor Dagobert Müller, secretary of the committee.

INTERNATIONAL COLLEGE OF SURGEONS

Southern California Chapter

The Third Western Sectional Meeting sponsored by the International College of Surgeons will be held in Las Vegas, Nevada, at the Riviera Hotel, beginning with registration on Sunday, November 20, 1960, and scientific meetings on Monday and Tuesday, November 21 and 22. A tentative programme will include presentation of 16 scientific papers.

The Riviera Hotel has offered their newest facility, a $500,000 convention hall and exhibit wing, which will accommodate 1400 persons. There is adequate space adjacent to the convention hall for scientific and commercial exhibits.

The Annual Banquet will be held on Monday evening in one of the most luxurious dining rooms of the hotel. One luncheon meeting will be devoted to a question and answer session by those presenting papers. The Women's Auxiliary will hold a luncheon-fashion show meeting for husbands and wives. Last year's convention was a great success, and it is expected that this one will be even more successful with many representatives from the 11 Western States, and also from the two new States, Alaska and Hawaii.

Further information may be obtained from the Secretary, Dr. F. M. Turnbull, Jr., M.D., 1930 Wilshire Blvd., Los Angeles 57, California.

BOOK REVIEWS

(See also pages 34, 49, 55, 64 and 81)

OSTEOCHONDRITIS DISSECANS. Loose Bodies in Joints. Etiology, pathology, treatment. I. S. Smillie, Lecturer-in-Charge, Department of Orthopædic Surgery, University of St. Andrews. 224 pp. Illust. E. & S. Livingstone, Ltd., Edinburgh and London. The Macmillan Company of Canada Limited, Toronto, 1960. $10.25.

This excellent and beautifully illustrated monograph on osteochondritis dissecans is the result of the author's interest in the knee joint and his experience with over 300 cases of this condition. The thesis is presented that lesions of similar radiological appearance can be separated into four distinct pathological entities: (1) anomalies of ossification, (2) juvenile osteochondritis dissecans, (3) adult osteochondritis dissecans, (4) tangential osteochondral fractures. All four of these are related in ætiology to the mild repetitive trauma causing osteochondritis dissecans. The relationship to abnormalities of endocrine function, local blood supply, or other constitutional factors is considered. In the juvenile variety trauma is superimposed on the ischæmic bone; in the adult group trauma produces the ischæmic bone.

The knee joint and Frieberg's infraction of the metatarso-phalangeal joint (Köhler's second disease) are the two most common sites. They are considered both from the view of ætiology and pathology in Part 1 and clinical features and treatment in Part 2. The less common sites—elbow, ankle and hip joints are of course also covered.

There is, from the introduction to the index, a logical development of the author's argument both in the text and carefully arranged numerous illustrations. This book can be highly recommended as a well reasoned account of the causes and conservative surgical management of osteochondritis dissecans.

BODY FLUIDS IN SURGERY. A. W. Wilkinson, Ch.M., F.R.C.S.E., F.R.C.S., Nuffield Professor of Pædiatric Surgery, The Institute of Child Health of the University of London. 276 pp. Illust. 2nd ed. E. & S. Livingstone Ltd., Edinburgh and London; The Macmillan Company of Canada Limited, Toronto, 1960. $3.60.

The second edition of Wilkinson's valuable book on fluid and electrolyte balance was needed and is up to date. Much work has been done in preparing this edition and a better understanding of the problems of the patient with disturbed fluid balance and chemistry has led to almost complete rewriting five years after the first edition. The rather complex material and the application of these concepts to the surgical patient before, during and after his operation is presented well. The book is readable. It includes a chapter on the disturbances of fluid and electrolyte balance in infancy and childhood, for though much remains to be done in the understanding of the physiology of the newborn baby, it is not enough to regard the infant as "just a little adult".

This book is recommended unreservedly to practising surgeons and students in surgery, and especially to those interested in gastrointestinal work, severe trauma and burns.

PRACTICAL PROCTOLOGY. Louis A. Buie, Sr., M.D., F.A.C.S., Emeritus Member, Section of Proctology, Mayo Clinic, and Emeritus Professor of Proctology, Mayo Foundation. 737 pp. Illust. 2nd ed. Charles C Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1960. $24.75.

(Continued on page 142)

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(Continued from page 140)

This is the second edition of a well known text, first published in 1937. Dr. Buie is one of the founders of the specialty of proctology and his long association with the Mayo Clinic gave him opportunity to see a great variety of cases in this field. His personal experience in proctology is almost unsurpassable. This book epitomizes a lifetime career in a field to which he himself made major contributions.

The text carries all the advantages and some of the disadvantages of a book based on wide personal experience. It is not a simple repetition of other textbooks in the field. The author impresses the reader in every line with the fact that he has seen and treated even the rarest conditions and that the choice of the method proposed is based on sound clinical experience. The disadvantage of such a presentation is a slight prejudice and sometimes disregard of other opinions.

The book is a well balanced text. It starts with chapters on anæsthesia in proctology and the methods of proctoscopy and sigmoidoscopy. The embryology and anomalies of the gastrointestinal tract are well described and beautifully illustrated. The diagnosis and treatment of hæmorrhoids, fistulae, prolapse, etc. are clearly described and the operative proceedures are well illustrated. Anal pruritis is discussed in 30 pages with some very useful therapeutic suggestions. The chapter on ulcerative colitis (or, as the author likes to call it, "thromboulcerative colitis") is handled with too much stress on surgery. One may almost get the impression that medical management is always doomed to failure.

In conclusion, this is a useful book for the general practitioner and the surgeon. Physicians and gastroenterologists who read it may often disagree but it may make them understand why there is so frequently a difference of opinion between themselves and their surgical colleagues.

KLINISCHE CHIRURGIE FUR DIE PRAXIS. In vier Banden. Band 11. Lieferung 1. (Clinical Practice of Surgery. In 4 volumes. Vol. 11. Part 11). Edited by O. Diebold, H. Junghanns and L. Zukschwerdt. 224 pp. Illust. Georg Thieme Verlag, Stuttgart, W. Germany. Intercontinental Medical Book Corporation, New York, 1960. $10.00.

The book under review is a segment of a four volume work on surgery, and deals with diseases of the chest.

The introduction contains a concise history of heart and lung surgery by Professor Dr. O. Diebold of Hamburg.

The book covers the fields of physiology and pathophysiology of respiration and circulation, as well as their function tests. These and the chapter on postoperative respiratory insufficiency are brought up to date and done exceedingly well. Further parts of the book deal with diseases of the chest wall and breast requiring surgical intervention.

In order to evaluate this book one has to understand the differences in the practice of surgery confronting the general practitioner in continental Europe and on the North American continent. In North America, the practitioner usually participates in the surgical procedure his patient is undergoing at the hospital, whereas in Europe the patient is turned over by his doctor to the hospital surgeon for operation.

Therefore, this book emphasizes the diagnostic part of diseases with all the tests involved, and selection of cases for operation, neglecting surgical techniques.

The chapter on cancer of the breast is more or less a German reprint of the same subject contained in Hamilton Bailey's excellent book "A SHORT PRACTICE OF SURGERY".

Readers of this book can look forward with interest to the publication of Volume 3 of this work dealing amongst other subjects with intestinal obstruction, and appendicitis and their surgical treatment.

For the German speaking physician taking his Medical Council of Canada examination and encountering language difficulties, this book will provide a valuable aid to preparation for his later studies of Hamilton Bailey's "A Short Practice of Surgery".

The reviewer considers that a translation of this book into the English language is not warranted.

KLINISCHE CHIRURGIE FUR DIE PRAXIS. In veir Banden. Band 111, Lieferung 1. (Clinical Practice of Surgery. In 4 volumes. Vol. 111. Part 1). Edited by O. Diebold, H. Junghanns and L. Zukschwerdt. 148 pp. Illust. Georg Thieme Verlag, Stuttgart, W. Germany. Intercontinental Medical Book Corporation, New York, 1960. $6.70.

The authors of this book are to be lauded for their chapters on abdominal surgery. Beginning with a description of the different laboratory tests, necessarily preceding surgery of the abdomen, the authors proceed with a classification of "emergency", "urgent" and "routine" operations, stressing the need for an overall estimation of the patient's operability before surgery.

The section on fluid and electrolyte balance is covered in detail with citations of normal values, and discussion of the causes of disturbances in electrolyte balance.

The chapter on peritonitis and its operative treatment covers this subject in detail. With no intent to detract from the value of this book, one need not accept without reservation the author's statement that at least 96% of all diffuse peritonitis cases have a fatal outcome unless immediate operation is performed. A more flexible approach to this problem with adjustment of the therapy in keeping with the origin of the peritonitis would seem appropriate in this regard.

The pages on hernia are well written, and readers will find a comprehensive classification of all types of herniae with diagrams and illustrations providing a ready understanding of this complex problem. Physicians dealing with herniae, resulting from accidents will be interested in the section dealing with accident and herniae, clarifying the connection between cause and result. The author establishes rules to be followed for recognition of such claims and cites Bier's six postulates.

The value of this book lies in its easy flow of uncomplicated language; a definite improvement over German textbooks of surgery of the past. Sentences are short and remarks to the point, bringing this book more in line with English publications.

It is of further interest to note that the authors quote extensively from British and North American medical literature.

A hard cover edition of the complete volume would prove beneficial to readers.

This book is highly recommended to physicians with a knowledge of the German language.

Books Received

Books are acknowledged as received, but in some cases reviews will also be made in later issues.

Actualités sur les Maladies des Veines. Varices, Phlébites, Hémorroides. Colloque tenu dans le service de Professeur André Sicard, Hôpital Beaujon, Paris, April 1958. 89 pp. Illust. L'Expansion Scientifique Française, Paris. 13NF.

Anti-Koagulantien in der Chirurgie. H. A. Thies and J. Oeri. 54 pp. Benno Schwabe & Company, Basel, Switzerland; Intercontinental Medical Book Corporation, New York, 1960. $1.75.

Clinical Orthopædics. Editor-in-Chief Anthony DePalma, with the assistance of the Associate Editors, The Board of Advisory Editors, The Board of Corresponding Editors. Number 16. 315 pp. Illust. J. P. Lippincott Company, Philadelphia and Montreal, 1960. $7.50.

Die Altersveranderungen der Halswirbelsaule. Ulrich Ecklin, Director of the Institute of Anatomy, Zurich University. 81 pp. Illust., Springer-Verlag, Berlin, Gottingen and Heidelberg, W. Germany, 1960. DM 28.

Die Behandlung der Schadelbasisbruche. Frontobasale und laterobasale Frakturen de Nase der Nebenhohlen und des Ohres. Prof. Dr. H.-G. Boenninghaus. Oberarzt der Université Hals-Nasen-Ohrenklinik, Frankfurt Am Main, West Germany. 200 pp. Illust. Georg Thieme Verlag, Stuttgart, W. Germany. Intercontinental Medical Book Corporation, New York, 1960. $9.05.

Exposés d'Anesthésiologie. A l'usage des practiciens et des étudiants. P. Huguenard et P. Jaquenoud. Première série. 218 pp. Illust. Masson & Cie, Paris. 23NF.

Exposes d'Anesthesiologie. A l'usage des practiciens et des étudiants. P. Huguenard et P.

(Continued from previous page)

Jaquenoud. Deuxième série. 274 pp. Illust. Masson & Cie, Paris. 23NF.

Fractures & Orthopædic Surgery for Nurses and Physiotherapists. Arthur Naylor, Ch.M., M.Sc. (Sheff.), F.R.C.S.(Eng.), F.R.C.S.(Edin.). Consultant in Orthopædic Surgery, Bradford Royal Infirmary, England. Foreword by Sir Ernest Finch, M.D., M.S.(Lond.), F.R.C.S.(Eng.), formerly Vice-President, Royal College of Surgeons of England. 4th ed. 358 pp. Illust., E. & S. Livingstone Ltd., Edinburgh and London; The Macmillan Company of Canada Limited, Toronto, 1960. $4.70.

Medicine in the Making. Gordon Murray. 335 pp. The Ryerson Press, Toronto, 1960. $5.50.

Non Penetrating Injuries of the Abdomen. R. H. Kennedy, Consulting Surgeon, Beekman-Downtown, Bellevue and University Hospitals, New York City. Edited by Lester R. Dragstedt, Research Professor of Surgery, University of Florida, Gainsville, Florida. 121 pp. Illust. Charles C Thomas, Springfield, Ill., The Ryerson Press, Toronto, 1960. $5.25.

Nouvelle Pratique Chirurgicale Illustrée. Fascicule XV (New Surgical Practice Illustrated, Fascicle XV). Edited by Jean Quénu. 286 pp. Illust. G. Doin et Cie, Paris, 1960. 39NF.

Peptic Ulceration. A Symposium for Surgeons. Charles Wells, Professor of Surgery, University of Liverpool, and James Kyle, M.B., M.Ch., F.R.C.S., F.R.C.S.(I.), Senior Lecturer in Surgery, University of Aberdeen. Foreword by Lester R. Dragstedt, Professor of Surgery, University of Florida. 260 pp. Illust. E. & S. Livingstone Ltd., Edinburgh and London; The Macmillan Company of Canada Limited, Toronto, 1960. $7.15.

Postmortem Homografts. James Barrett Brown, M.D., F.A.C.S. and Minot P. Fryer, M.D., F.A.C.S., Plastic Surgery Service, Department of Surgery, Washington University School of Medicine, St. Louis, Missouri. 64 pp. Illust., Charles C Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1960. $6.00.

Rose and Carless Manual of Surgery. Consulting Editor Sir Cecil Wakeley, Bt., K.B.E., C.B. Edited by Michael Harmer and Selwyn Taylor, assisted by 15 contributors. 1389 pp. Illust. 19th ed. Baillière, Tindall and Cox, London, 1960. $14.25.

Surgery and Clinical Pathology in the Tropics. Charles Bowesman, O.B.E., B.A., M.D., F.R.C.S.E., F.A.C.S., D.T.M., & H.Ed., Fellow of the Royal Society of Medicine; Fellow of the Royal Society of Tropical Medicine and Hygiene. 1068 pp. Illust. E. & S. Livingstone Ltd., Edinburgh and London; The Macmillan Company of Canada Limited, Toronto, 1960. $18.70.

Surgical Errors and Safeguards. Max Thorek, M.D., LL.D., F.I.C.S., F.B.C.S., F.P.C.S.(Hon.), D.C.M., F.R.S.M. Professor of Surgery, Cook County Graduate School of Medicine, Surgeon-in-Chief, American Hospital of Chicago, Founder and Secretary General of the International College of Surgeons. 5th ed. 652 pp. Illust. J. P. Lippincott Company, Philadelphia and Montreal, 1960. $25.00.